

# SYLVANIA

# TUBE SUBSTITUTION

# MANUAL

- quick references for  
substitutions of critical  
radio and television tubes



**SYLVANIA**  **ELECTRIC**  
PRODUCTS INC., EMPORIUM, PENNA.

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critical Radio and Television Tubes**



**A Technical Publication of  
SYLVANIA ELECTRIC PRODUCTS INC.  
EMPORIUM, PENNA.**

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# GENERAL TUBE CLASSIFICATIONS

The following classified listing has been prepared to assist service technicians and engineers in selecting substitutions for types not listed in the charts or when a major change in power supply is undertaken.

The characteristics selected for listing do not mean that the others are not important. The intention is to enable the user to select a group of possible tubes and then eliminate those which for other reasons may be undesirable.

The classifications into which the types have been grouped are those which our experience has found most useful. Television, of course, being so new, has required the addition of two groups of scanning tubes and the high voltage rectifiers. Other television tube functions have been included with the corresponding radio receiving types. One exception is the television converter tube which being usually a high frequency duo-triode is listed with the H.F. triodes.

As an example of its use let us consider the selection of an F.M. diode triode to replace Type 7K7. The first thing to note is that 7K7 has the diode cathodes separate from the triode cathode. This limits the selection immediately and brings up the possibility of using separate diodes, either in a tube, using a miniature if there are space limitations, or germanium crystals. To find the nearly direct replacements run down the column for amplification constant in the diode triodes; since the 7K7 has a  $\mu$  of 70, select those having a value between 50 and 100 and having 6.3 volt heaters. There are 20 of these, but a quick check of the basing diagrams in the Sylvania Receiving Tubes Characteristics Chart eliminates all but 6S8GT and 6T8 (Type 7X7 has one separate diode and one on the triode cathode.) If none of these are available the separate diode alternatives must be considered. If that is the case all 20 of the selected types in the diode triode table as well as the high  $\mu$  types in the general purpose triodes can be tried.

AMPLIFIERS (REMOTE CUT-OFF R-F)					Type	Ef	If	Style	Gm	AMPLIFIERS (SHARP CUT-OFF RF)				
Pentodes — Tetrodes										Pentodes — Tetrodes				
Type	Ef	If	Style	Gm						Type	Ef	If	Style	Gm
1A4P	2.0	0.06	ST-12	625 725	6U7G	6.3	0.30	ST-12	1500 1600	1AE4	1.25	0.10	Min.	1550
IA4T	2.0	0.06	ST-12	625 650	7A7	6.3	0.30	Lock-in	2350 2000	IAF4	1.4	0.025	Min.	825 950
IAB5	1.2	0.13	Lock-in	1100 1350	7AH7	6.3	0.15	Lock-in	1675 1750	1B4P	2.0	0.06	ST-12	560 650
1D5GP	2.0	0.06	ST-12	625 725	7B7	6.3	0.15	Lock-in	4000 4900	1E5GP	2.0	0.06	ST-12	560 650
1D5GT	2.0	0.06	ST-12	625 650	7H7	6.3	0.30	Lock-in	4000 4900	1L4	1.4	0.05	Min.	925 1025
IP5GT	1.4	0.05	GT	750	7T7	6.3	0.3	Lock-in	2350 2000	1LC5	1.4	0.05	Lock-in	750 775
1SA6GT	1.4	0.05	GT	750 950 970	12BA6	12.6	0.15	Min.	4300 4400	1LG5	1.4	0.05	Lock-in	800 800 1050
1T4	1.4	0.05	Min.	700 900	12BD6	12.6	0.15	Min.	2350 2000	1LN5	1.4	0.05	Lock-in	800
6AB7	6.3	0.45	Metal	3500	12K7GT	12.6	0.15	GT	4100 4700 4000	IN5GT	1.4	0.05	GT	750
6BA6	6.3	0.30	Min.	4200 4400	12SG7	12.6	0.15	Metal	2300 2000	1U4	1.4	0.05	Min.	900
6BD6	6.3	0.30	Min.	2000 2350	12SK7/GT	12.6	0.15	Metal/GT	2300 2000	3E6	1.4	0.10	Lock-in	2100 1800
6BJ6	6.3	0.15	Min.	3600 3650	14A7	12.6	0.15	Lock-in	2350 2000	6AC7	6.3	0.45	Metal	6750
6D6	6.3	0.30	ST-12	1500 1600	14H7	12.6	0.15	Lock-in	4000	6AG5	6.3	0.30	Min.	4750 5100 5000
6E7	6.3	0.30	ST-12	1500 1600	26A6	26.5	0.07	Min.	2000 4000	6AH6	6.3	0.45	Min.	9000
6K7/G	6.3	0.30	Metal/ST-12	1650 1450	34..	2.0	0.06	ST-14	560 600 620	6AJ5	6.3	0.175	Min.	2750
6K7GT	6.3	0.30	GT	1650 1450	35/51	2.5	1.75	ST-14	1020 1050	6AK5	6.3	0.175	Min.	5000 4300 5100
6R6G	6.3	0.3	ST-12	1160	35S/51S	2.5	1.75	ST-14	1020 1050	6AM6	6.3	0.30	Min.	7500
6S7/G	6.3	0.15	Metal/ST-12	1250 1750	39/44	6.3	0.30	ST-12	960 1000 1050	6AS6	6.3	0.175	Min.	3500
6SD7GT*	6.3	0.30	GT	3350 3600	58/58S	2.5	1.0	ST-12	1500 1600	6AU6	6.3	0.30	Min.	3900 4450 5200
6SG7*	6.3	0.30	Metal	4100 4700 4000	58AS	6.3	0.40	ST-12	1500 1600	6BC5	6.3	0.30	Min.	4900 6100 5700
6SG7GT*	6.3	0.30	GT	4100 4700 4000	78	6.3	0.30	ST-12	1275 1100 1450	6BH6	6.3	0.15	Min.	3400 4600
6SK7/GT	6.3	0.30	Metal/GT	2350 2000	5590*	6.3	0.15	Min.	2000	6C6	6.3	0.30	ST-12	1185 1225
6SS7	6.3	0.15	Metal	1950 1850	5725	6.3	0.175	Min.		6CB6	6.3	0.30	Min.	6200
					9001*	6.3	0.15	Min.	1400	6D7	6.3	0.30	ST-12	1185 1225
					*Semi-remote					6J7	6.3	0.30	Metal	1225
										6J7G	6.3	0.30	ST-12	1225

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## Amplifiers (Sharp cut-off RF) Cont'd

Type	Ef	If	Style	Gm
6J7GT	6.3	0.30	GT	1225
6SE7GT	6.3	0.30	GT	3100
				3400
6SH7	6.3	0.30	Metal	4000
				4900
6SH7GT	6.3	0.30	GT	4000
				4900
6SJ7/GT	6.3	0.30	Metal/GT	1575
				1650
6W7G	6.3	0.15	ST-12	1225
7AB7	6.3	0.15	Lock-in	1800
7AD7	6.3	0.60	Lock-in	9500
7AG7	6.3	0.15	Lock-in	4200
7AJ7	6.3	0.3	Lock-in	2275
				1575
7AK7	6.3	0.8	Lock-in	6500
7C7	6.3	0.15	Lock-in	1225
				1300
7G7	6.3	0.45	Lock-in	4500
7L7	6.3	0.30	Lock-in	3000
				3100
7V7	6.3	0.45	Lock-in	5800
7W7	6.3	0.45	Lock-in	5800
12AU6	12.6	0.15	Min.	3900
				4450
				5200
12AW6	12.6	0.15	Min.	5000
				5100
				4750
12J7GT	12.6	0.15	GT	1225
12SH7/GT	12.6	0.15	Metal/GT	4000
				4900
12SJ7	12.6	0.15	Metal	1575
				1650
12SJ7GT	12.6	0.15	GT	1575
				1650
14C7	12.6	0.15	Lock-in	2275
				1575
14W7	12.6	0.225	Lock-in	5800
15	2.0	0.22	ST-12	710
				750
22	3.3	0.132	ST-14	125
24A/24S	2.5	1.75	ST-14	1000
				1050
32	2.0	0.06	ST-14	640
				650
36	6.3	0.30	ST-12	1000
				1050
				1080
EF50	6.3	0.30	Metal/Glass	6300
57/57S	2.5	1.0	ST-12	1185
				1225
57AS	6.3	0.40	ST-12	1185
				1225
77	6.3	0.30	ST-12	1100
				1250
1221	6.3	0.30	ST-12	1185
				1225
1223	6.3	0.30	ST-12	1185
				1225
1229	2.0	0.06	ST-12	Spec.
				Type 32
1231	6.3	0.45	Lock-in	5500
				6500
1273	6.3	0.30	Lock-in	2275
				1575
1280	12.6	0.15	Lock-in	2275
				1575
5591	6.3	0.15	Min.	5000
				4300
				5100
5654	6.3	0.175	Min.	5000
5693	6.3	0.3	Metal	1650
5847	6.3	0.3	T-6½	12500
5879	6.3	0.15	T-6½	1000
5901	1.4	0.05	Min.	900
9003	6.3	0.15	Min.	1800

## CONVERTERS

Type	Ef	If	Style	Gc
1A6	2.0	0.06	ST-12	275
				300
1A7GT	1.4	0.05	GT	250
1B7GT	1.4	0.10	GT	350
1C6	2.0	0.12	ST-12	300
				325
1C7G	2.0	0.12	ST-12	300
				325
1C8	1.25	0.04	T-3	100
1D7G	2.0	0.06	ST-12	275
				300
1L6	1.4	0.05	Min.	300
1LA6	1.4	0.05	Lock-in	250
1LB6	1.4	0.05	Lock-in	100
1LC6	1.4	0.05	Lock-in	250
				275
1R5	1.4	0.05	Min.	235
				300
1U6	1.4	0.025	Min.	260
				275
2A7/2A7S	2.5	0.80	ST-12	360
				550
6A7/6A7S	6.3	0.30	ST-12	360
				550
6A8	6.3	0.30	Metal	360
				550
6A8G	6.3	0.30	ST-12	360
				550
6A8GT	6.3	0.30	GT	360
				550
6AN7	6.3	0.23	T-6½	750
6BA7	6.3	0.30	T-6½	900
				950
6BE6	6.3	0.30	Min.	455
				475
6D8G	6.3	0.15	ST-12	325
				550
6J8G	6.3	0.30	ST-12	290
6K8	6.3	0.30	Metal	350
6K8G/GT	6.3	0.30	ST-12/GT	350
6L7	6.3	0.30	Metal	350*
6L7G	6.3	0.30	ST-12	350*
7A8	6.3	0.15	Lock-in	375
				550
7B8	6.3	0.3	Lock-in	360
				550
7J7	6.3	0.30	Lock-in	280
				290
7Q7	6.3	0.30	Lock-in	525
				550
7S7	6.3	0.30	Lock-in	500
				525
12A8GT	12.6	0.15	GT	360
				550
12BA7	12.6	0.15	T-6½	900
				950
12BE6	12.6	0.15	Min.	455
				475
12K8	12.6	0.15	Metal	350
12K8GT	12.6	0.15	GT	350
12SA7	12.6	0.15	Metal	425
				450
12SA7GT	12.6	0.15	GT	425
				450
12SY7	12.6	0.15	Metal	450
14B8	12.6	0.15	Lock-in	360
				550
14J7	12.6	0.15	Lock-in	280
				290
14Q7	12.6	0.15	Lock-in	525
				550
14S7	12.6	0.15	Lock-in	500
				525
26D6	26.5	0.07	Min.	270
				455
				475
FM1000	6.3	0.30	Lock-in	...
1612	6.3	0.30	Metal	350*

\*require separate oscillator

## DIODE DETECTORS

### Single and Double

Type	Ef	If	Style	Output Current Ma/plate
1A3	1.4	0.150	Min.	0.5
1R4	1.4	0.150	Lock-in	1.0
2S/4S	2.5	1.35	ST-12	40.0
6AL5	6.3	0.30	Min.	9.0
6AN6	6.3	0.20	Min.	8.0
6BC7	6.3	0.45	T-6½	12.0
6H4GT	6.3	0.15	GT	4.0
6H6/GT	6.3	0.30	Metal/GT	8.0
7A6	6.3	0.15	Lock-in	8.0
7C4	6.3	0.15	Lock-in	5.0
12AL5	12.6	0.15	Min.	9.0
12H6	12.6	0.15	Metal	8.0
5679	6.3	0.15	Lock-in	8.0
5726	6.3	0.30	Min.	9.0
9006	6.3	0.15	Min.	5.0

## DIODE-PENTODES

Type	Ef	If	Style	Gm
1AF5	1.4	0.025	Min.	500
				600
1F6	2.0	0.06	ST-12	650
1F7G	2.0	0.06	ST-12	650
1F7GV	2.0	0.06	ST-12	650
1LD5	1.4	0.05	Lock-in	550
				575
1N6G	1.4	0.05	GT	800
1S5	1.4	0.05	Min.	625
1SB6GT	1.4	0.05	GT	665
				500
1U5	1.4	0.05	Min.	625
2B7/2B7S	2.5	0.80	ST-12	950
6B8/G	6.3	0.30	Metal/ST-12	950
6B8GT	6.3	0.30	GT	950
6N8	6.3	0.30	T-6½	2200
6SF7	6.3	0.30	Metal	1975
				2050
6SV7	6.3	0.30	Metal	3600
7E7	6.3	0.30	Lock-in	1600
				1300
7R7	6.3	0.30	Lock-in	2100
				3000
12C8	12.6	0.15	Metal	950
12SF7	12.6	0.15	Metal	1975
				2050
14E7	12.6	0.15	Lock-in	1600
				1300
14R7	12.6	0.15	Lock-in	2100
				3000

## DIODE TRIODES (DETECTOR-AMPLIFIER)

### Single Diode Triode Duo Diode Triode Triple Diode Triode

Type	Ef	If	Style	μ
1B5	2.0	0.06	ST-12	20
1H4G	2.0	0.06	ST-12	9.3
1H5GT	1.4	0.05	GT	65
1H6G	2.0	0.06	ST-12	20
1LH4	1.4	0.05	Lock-in	65
2A6	2.5	0.80	ST-12	100
6AQ6	6.3	0.15	Min.	70
6AQ7GT	6.3	0.30	GT	70
6AT6	6.3	0.30	Min.	70
6AV6	6.3	0.30	Min.	100
6AW7GT	6.3	0.30	GT	80
6B6G	6.3	0.30	ST-12	100
6BD7	6.3	0.23	T-6½	70
6BF6	6.3	0.30	Min.	16
6BK6	6.3	0.30	Min.	100
6BT6	6.3	0.30	Min.	70

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Diode Triode (Continued)					Type	Ef	If	Style	$\mu$	Type	Ef	If	Style	$\mu$
Type	Ef	If	Style	$\mu$	6V7G	6.3	0.30	ST-12	8.3	12SQ7/GT	12.6	0.15	Metal/GT	100
6BU6	6.3	0.30	Min.	16.5 16.0	7B6	6.3	0.30	Lock-in	100	12SR7	12.6	0.15	Metal	16
6C7	6.3	0.30	ST-12	20	7C6	6.3	0.15	Lock-in	85 100	12SW7	12.6	0.15	Metal	17 16
6Q7	6.3	0.30	Metal	70	7E6	6.3	0.30	Lock-in	16	14B6	12.6	0.15	Lock-in	100
6Q7G	6.3	0.30	ST-12	70	7K7	6.3	0.30	Lock-in	16.5 70	14E6	12.6	0.15	Lock-in	16 16.5
6Q7GT	6.3	0.30	GT	70	7X7	6.3	0.30	Lock-in	85 100	14X7	12.6	0.15	Lock-in	85 100
6R7	6.3	0.30	Metal	16	12AT6	12.6	0.15	Min.	70	19C8	18.9	0.15	T-6½	100
6R7GT	6.3	0.30	GT	16	12AV6	12.6	0.15	Min.	100	19T8	18.9	0.15	Min.	70
6R8	6.3	0.45	T-6½	16	12BF6	12.6	0.15	Min.	16	26BK6	26.5	0.07	Min.	100
6S8GT	6.3	0.30	GT	100	12BK6	12.6	0.15	Min.	100	26C6	26.5	0.07	Min.	17 16
6SQ7GT	6.3	0.30	GT	16	12BT6	12.6	0.15	Min.	70	55/55S	2.5	1.0	ST-12	8.3
6SR7/GT	6.3	0.30	Metal/GT	16	12BU6	12.6	0.15	Min.	16.5 16.0	75 or 75S	6.3	0.30	ST-12	100
6ST7	6.3	0.15	Metal	16	12Q7GT	12.6	0.15	GT	70	85	6.3	0.30	ST-12	8.3
6SZ7	6.3	0.15	Metal	70	12S8GT	12.6	0.15	GT	100	85AS	6.3	0.30	ST-12	20
6T7G	6.3	0.15	ST-12	65										
6T8	6.3	0.45	T-6½	70										

DUO-TRIODES						Type	Ef	If	Style	Gm	$\mu$
Type	Ef	If	Style	Gm	$\mu$	14N7	12.6	0.15	Lock-in	3000 2600	20
2C21	6.3	0.60	ST-12	1375	10.4	19J6	18.9	0.15	Min.	1900	38
2C51	6.3	0.30	T-6½	5500	35.0	5608-A	2.5	2.0	ST-14	2200 2450	16 17
2C52	12.6	0.30	GT	1900	100.0	5687	6.3	0.90	T-6½	5200	16
3A5	1.4	0.22	Min.	1800	15.0		12.6	0.45		8100	
3B7	2.8	0.11				5691	6.3	0.6	GT	1600	70
	2.8	0.110	Lock-in	1900		5692	6.3	0.6	GT	2200	20
3C6	1.4	0.10	Lock-in	1300		5694	6.3	0.8	ST-14	3100 3200	35
	2.8	0.05		1300 1100							
6AE7GT	6.3	0.50	GT	3000	14.0	INDICATORS					
6AH7GT	6.3	0.30	GT	1550	16.0	Type	Ef	If	Style	Gm	Target Current Ma.
				1900		2E5	2.5	0.80	T-9		1.0 4.0 2.0
6BQ7	6.3	0.40	T-6½	6000	35.0	6AB5/6N5	6.3	0.15	T-9		2.0
6C8G	6.3	0.30	ST-12		36.0	6AD6G	6.3	0.15	T-9		
6F8G	6.3	0.30	ST-12	2600	20.0	6AF6G	6.3	0.15	T-9		
6J6	6.3	0.45	Min.	5300	38.0	6AL7GT	6.3	0.90	GT		
6N7/GT	6.3	0.80	Metal/GT	3100 3200	35.0	6E5	6.3	0.30	T-9		1.0 4.0 3.0
6SC7/GT	6.3	0.30	Metal/GT	1325	70.0	6T5	6.3	0.15	ST-12		1.0 4.0 2.0
6SL7GT	6.3	0.30	GT	1600	70.0	6U5	6.3	0.30	T-9		1.0 4.0 1.0 4.0
6SL7WGT											
6SN7GT				3000	20.0	1629	12.6	0.15	GT		
6SN7WGT				2600							
6SU7GT	6.3	0.30	GT	1600	70.0	MULTI-PURPOSE TUBES					
7AF7	6.3	0.30	Lock-in	2600 1900	17.0 16.0	Type	Ef	If	Style	Gm	Class
				2100		1B8GT	1.4	0.10	GT	275 1150	Diode-Triode Pent.
7F7	6.3	0.30	Lock-in	1125 1600	70.0	1D8GT	1.4	0.100	GT	325 925	Diode-Triode Pent.
7F8	6.3	0.30	Lock-in	3300		2B7	2.5	0.80	ST-12	950 840	Triode Pentode
7N7	6.3	0.60	Lock-in	3000 2600	20.0					1000	
12AH7GT	12.6	0.15	GT	1550 1900	16.0	3A8GT	1.4	0.10	GT	325 750	Diode-Triode Pent.
12AT7	6.3	0.30	T-6½	4000	54.0		2.8	0.05		325	Triode Pentode
	12.6	0.15		6600	62.0	6AD7G	6.3	0.85	ST-14	2500	Triode Pentode
12AU7	12.6	0.15	T-6½	5500	55.0					950	Triode Pentode
	6.3	0.30		2200	17.0	6B7/S	6.3	0.30	ST-12	840 1000	Dual Tetrode
12AV7	12.6	0.225	T-6½	3100	19.5		6.3	0.30	Lock-in	2100	Triode Pentode
	6.3	0.450		6100	37.0	7G8	6.3	0.30	GT	1800	Rectifier-Pentode
12AX7	12.6	0.15	T-6½	8500	41.0	12B8GT	12.6	0.30	GT	2400	Triode Pentode
	6.3	0.30		1250	100.0	25A7GT	25.0	0.30	GT	1800	Rectifier-Pentode
12AY7	12.6	0.15	T-6½	1600		25B8GT	25.0	0.15	GT	2000	Triode Pentode
12SC7	12.6	0.15	Metal	1325	70.0					1500	Triode Pentode
12SL7GT	12.6	0.15	GT	1600	70	25D8GT	25.0	0.15	GT	1100 1900	Triode Pentode
12SN7GT	12.6	0.15	GT	3000 2600	20	28D7/W	28.0	0.40	Lock-in	3400	Dual Tetrode
12SX7GT	12.6	0.30	GT	1800	21	32L7GT	32.5	0.30	GT	6000	Rectifier-Beam Amp.
				3000	20	70A7GT	70.0	0.15	GT	5800	Rectifier-Beam Amp.
14AF7/XXD	12.6	0.15	Lock-in	2600	17	70L7GT	70.0	0.15	GT	7500	Rectifier-Beam Amp.
				1900	16	117L7/M7GT	117.0	0.09	GT	5300	Rectifier-Beam Amp.
14F7	12.6	0.15	Lock-in	2100 1125	70	117N7GT	117.0	0.09	GT	7000	Rectifier-Beam Amp.
				1600		117P7GT	117.0	0.09	GT	5300	Rectifier-Beam Amp.

**-SYLVANIA SUBSTITUTION MANUAL**

POWER AMPLIFIERS					Power Output Mw.						Power Output Mw.			
Triodes				Type		Ef	If	Style	Type	Ef		If	Style	
Pentodes														
Beam Amplifiers														
Tetrodes														
Class B Duo Triodes														
Type	Ef	If	Style											
1A5GT	1.4	0.05	GT	100	6AB6G	6.3	0.50	ST-12	3500	18	14.0	0.30	ST-14	4800
1AC5	1.25	0.04	T-3	115	6AC5GT	6.3	0.40	GT	3700					11000
				450					8000					18000
1C5GT	1.4	0.10	GT	600	6AC6GT	6.3	1.1	GT	3600	19	2.0	0.26	ST-12	2100
				700	6AG7	6.3	0.65	Metal	3000					1900
1E7G	2.0	0.24	ST-12	240	6AH5G	6.3	0.9	ST-16	10800					1600
1F4	2.0	0.12	ST-12	575	6AK6	6.3	0.15	Min.	1100	19BG6G	18.9	0.30	ST-16	50
1F5G	2.0	0.12	ST-12	310	6AK7	6.3	0.65	Metal	3000	20	3.3	0.132	T-8	130
1G5G	2.0	0.12	ST-14	310	6AL6G	6.3	0.9	ST-16	10800					900
1G6GT	1.4	0.10	GT	250	6AM5	6.3	0.2	Min.	1400	25A6/GT	25	0.30	Metal/GT	2000
1J5G	2.0	0.12	ST-14	675	6AN5	6.3	0.45	Min.	1300					2200
1J6G	2.0	0.24	ST-12	575	6AQ5	6.3	0.45	Min.	4500					770
				2100					2000	25A7GT	25	0.30	GT	2000
1LA4	1.4	0.05	Lock-in	1900	6AR5	6.3	0.40	Min.	3200	25AC5GT	25	0.30	GT	2000
1LB4	1.4	0.05	Lock-in	1600					3400	25B5	25	0.30	ST-12	2000
				100	6AS5	6.3	0.80	Min.	2200					3800
1Q5GT	1.4	0.10	GT	115	6AS7G	6.3	2.5	GT	3200	25B6G	25	0.30	ST-14	2400
1S4	1.4	0.10	Min.	100	6B4G	6.3	1.00	ST-16	1500	25C6G	25	0.30	ST-14	3600
1T5GT	1.4	0.05	GT	270					1000					6000
1W4	1.4	0.05	Min.	65	6B5	6.3	0.80	ST-14	4000	25L6	25	0.30	Metal	2100
				270	6BF5	6.3	1.2	Min.						4300
				170	6BG6G	6.3	0.90	ST-16		25L6GT	25	0.30	GT	2100
				35	6CD6G	6.3	2.5	ST-16	750					4300
				90	6E6	6.3	0.60	ST-14	1600	25N6G	25	0.30	ST-12	2000
				200					3200					3800
				270	6F6	6.3	0.70	Metal	4800	26A7GT	26.5	0.6	GT	5500
				100	6F6G/GT	6.3	0.70	ST-14/GT	11000	31	2.0	0.13	ST-12	185
				3500					18000					375
2A3	2.5	2.50	ST-16	15000	6G6G	6.3	0.15	ST-12	600	32L7GT	32.5	0.30	GT	1000
2A5	2.5	1.75	ST-14	3200					1100	33	2.0	0.26	ST-14	70
				4800	6K6GT	6.3	0.40	GT	350					90
				11000					3400	35A5	35.0	0.15	Lock-in	1500
3A4	1.4	0.20	Min.	600	6L6	6.3	0.90	Metal	4500					1300
3B5GT	2.8	0.10	GT	700	6L6G	6.3	0.90	ST-16	6500	35B5	35.0	0.15	Min.	1500
3C5GT	1.4	0.10	GT	70	6L6GA	6.3	0.90	ST-14	10800	35C5	35.0	0.15	Min.	1500
3D6	2.8	0.05	Lock-in	180					17500	35L6GT	35.0	0.15	GT	3300
3E5	1.4	0.220	Lock-in	1400	6M5	6.3	0.71	T-6½	26500	38	6.3	0.30	ST-12	925
	1.4	0.050	Min.	100	6N6G	6.3	0.80	ST-14	47000					1050
	2.8	0.025		200	6U6GT	6.3	0.75	GT	3900	41	6.3	0.40	ST-12	1200
				90					4000					350
				175	6V6/GT	6.3	0.45	Metal/GT	2000	42	6.3	0.65	ST-14	4800
3LE4	2.8	0.05	Lock-in	300					4500					11000
3LF4	1.4	0.10	Lock-in	325	6W6GT	6.3	1.20	GT	10000	43	25.0	0.30	ST-14	900
	1.4	0.10		250					14000	45	2.5	1.50	ST-14	830
	2.8	0.05		400	6Y6G	6.3	1.25	ST-14	2100					1600
				230	6Y7G	6.3	0.60	ST-12	3600	46	2.5	1.75	ST-16	2000
3Q4	1.4	0.10	Min.	330	6Z7G	6.3	0.30	ST-12	6000	47	2.5	1.75	ST-16	1250
	2.8	0.05		250	7A5	6.3	0.75	Lock-in	8000	48	30.0	0.40	ST-16	2700
3Q5GT	1.4	0.10	GT	270	7B5	6.3	0.40	Lock-in	2500	49	2.0	0.12	ST-14	2000
3S4	2.8	0.05	Min.	230					4200	50	7.5	1.25	ST-16	3000
3V4	1.4	0.10	Min.	235	7C5	6.3	0.45	Lock-in	1500					170
	2.8	0.05		250					2200					3500
				270	10	7.5	1.25	ST-16	350					1600
4A6G	2.0	0.12	ST-12	240					3400	50A5	50.0	0.15	Lock-in	2100
	4.0	0.06		1000	12A5	12.6	0.30		4500					4600
5A6	5.0	0.230	T-6½	2800					2000	50B5	50.0	0.15	Min.	1900
	2.5	0.460		3100	12A6	12.6	0.15	Metal	4500	50C5	50.0	0.15	Min.	1900
6A3	6.3	1.00	ST-16	3200	12A6GT	12.6	0.15	GT	5500	50C6G	50.0	0.15	ST-14	3600
				1500	12A7	12.6	0.3	ST-12	14000					6000
				1000	12L8GT	12.6	0.15	GT	400	50L6GT	50.0	0.15	GT	2100
6A4/LA	6.3	0.30	ST-14	700					900					4300
				1500	12A5	12.6	0.30		1600	VT52	7.7	5.0	ST-17	1000
6A5G	6.3	1.25	ST-16	3750					800	53	2.5	2.0	ST-14	10000
				15000	12A6	12.6	0.15	Metal	3400	59	2.5	2.0	ST-16	1250
6A6	6.3	0.80	ST-14	10000	12A6GT	12.6	0.15	GT	3400					3000
					12A7	12.6	0.3	ST-12	550	71A	5.0	0.25	ST-14	125
					12L8GT	12.6	0.15	GT	300					400
									1000					790
					14A5	12.6	0.15	Lock-in	2800	79	6.3	0.60	ST-12	5500
					14C5	12.6	0.15	Lock-in	2000					8000
									4500	89	6.3	0.40	ST-12	300
									5500					1500
									10000					3500
									14000	182B/482B	5.0	1.25	ST-14	1350
										183/483	5.0	1.25	ST-14	1800

# GENERAL TUBE CLASSIFICATIONS

## Power Amplifiers (Cont'd)

Type	Ef	If	Style	Power Output Mw.
210-T	7.5	1.25	ST-16	400
				900
				1600
950	2.0	0.12	ST-14	1000
1276	6.3	1.00	ST-16	3200
				1500
				1000
5686	6.3	0.35	T-6½	2700
5824	25	0.30	ST-14	4300
5932	6.3	0.90	T-12	10800

## RECTIFIERS (GENERAL PURPOSE) Including Voltage Doublers

Type	Ef	If	Style	Current Output Ma.
OY4	...	...	Metal	75
OY4G	...	...	T-7	75
OZ4	...	...	Metal	90
OZ4A	...	...	Metal	110
OZ4G	...	...	T-7	90
1V	6.3	0.30	ST-12	45
2W3GT	2.5	1.50	GT	55
2Z2/G84	2.5	1.50	ST-12	50
5AX4GT	5.0	2.25	GT	150
5AZ4	5.0	2.0	Lock-in	125
5R4GY	5.0	2.0	ST-16	150
				175
5T4	5.0	2.0	Metal	225
5U4G	5.0	3.0	ST-16	225
5U4WG	5.0	3.0	T-12	225
5V4G	5.0	2.0	ST-14	175
5W4	5.0	1.50	Metal	110
5W4GT	5.0	1.50	GT	110
5X3	5.0	2.0	ST-14	110
				30
5X4G	5.0	3.0	ST-16	225
				125
5Y3GT	5.0	2.0	GT	125
5Y4G	5.0	2.0	ST-14	125
5Z3	5.0	3.0	ST-16	225
5Z4	5.0	2.0	Metal	125
5Z4GT	5.0	2.0	GT	125
6AX5GT	6.3	1.2	GT	125
6AX6GT+	6.3	2.5	ST-14	250
6BY5G+	6.3	1.6	ST-14	175
6U4GT	6.3	1.2	GT	125
6V4	6.3	0.60	T-6½	90
6W4GT	6.3	1.2	GT	125
6X4	6.3	0.60	Min.	70
6X5	6.3	0.60	Metal	70
6X5GT	6.3	0.60	GT	70
6X5WGT	6.3	0.60	GT	70
6Y5	6.3	0.80	ST-12	50
6Z4	6.3	0.60	ST-12	60
6Z5	6.3	0.80		
	12.6	0.40	ST-12	60
6ZY5G	6.3	0.30	ST-12	40
7X6+	6.3	1.2	Lock-in	75
7Y4	6.3	0.50	Lock-in	70
7Z4	6.3	0.90	Lock-in	100
12Z3	12.6	0.30	ST-12	55
14Y4	12.6	0.30	Lock-in	70
25W4GT	25	0.30	GT	125
25X6GT+	25	0.15	GT	60
25Z4	25	0.30	Metal	125
25Z6+	25	0.30	Metal	75
25Z6GT+	25	0.30	GT	75
28Z5	28.0	0.24	Lock-in	100
35W4	35.0	0.15	Min.	60
				100
35Y4	35.0	0.15	Lock-in	60
				100
35Z3	35.0	0.15	Lock-in	100
35Z4GT	35.0	0.15	GT	100
35Z5GT	35.0	0.15	GT	100
35Z6G+	35.0	0.30	ST-14	110
40Z5/	45.0	0.15	GT	60
45Z5GT				100
45Z3	2.5	1.50	ST-14	65
50AX6G+	50.0	0.30	ST-14	250
50Y6GT+	50.0	0.15	GT	75

Type	Ef	If	Style	Current Output Ma.
50Z6G+	50	0.30	ST-12	250
80	5.0	2.0	ST-14	125
81	7.5	1.25	ST-16	85
82	2.5	3.0	ST-14	115
83	5.0	3.0	ST-16	225
83V	5.0	2.0	ST-14	175
84/6Z4	6.3	0.50	ST-12	60
117Z3	117	0.04	Min.	90
117Z4GT	117	0.04	GT	90
117Z6GT+117.0	0.075	GT		60
1005/				
CK1005	6.3	0.1	Metal	70
1274	6.3	0.60	GT	70
1275	6.3	0.60	ST-16	225
5517/				
CK1013	Cold K	Min.		6
5931	5.0	3.0	T-12	225

+These types may also be used as voltage doublers.

## RECTIFIERS (HIGH VOLTAGE TV)

Type	Ef	If	Style	Current Output Ma.
1B3GT	1.25	0.20	GT	2.0 Ma.
1V2	0.625	0.30	T-6½	0.5 Ma.
1X2	1.25	0.20	T-6½	1.0 Ma.
1Y2	1.5	0.29	Min.	2.0 Ma.
1Z2	1.5	0.30	Min.	2.0 Ma.
2V3G	2.5	5.0	ST-12	2.0 Ma.
2X2 (A)	2.5	1.75	ST-12	7.5 Ma.
6Y3G	6.3	0.7	ST-12	7.5 Ma.
5642	1.25	0.140	T-3	0.2 Ma.

## RELAY TUBES

### Gas Triodes and Tetrodes

Type	Ef	If	Style	Cath. Ma.
OA4G	Cold K	ST-12		25
2A4G	2.5	2.50	ST-12	100 Max.
2C4	2.5	0.65	Min.	5
2D21	6.3	0.60	Min.	100 Max.
6D4	6.3	0.25	Min.	25
884	6.3	0.60	ST-12	300 Peak
885	2.5	1.50	ST-12	300 Peak
1267	Cold K	GT		25
2050	6.3	0.60	ST-12	100 Max.
2051	6.3	0.60	ST-12	75 Max.

## TV SCANNERS (Horizontal)

Type	Ef	If	Style	Gm
6AR6G	6.3	1.20	T-11	5400
				4300
6AU5GT	6.3	1.25	GT	
6AV5GT	6.3	1.20	GT	5500
6BD5GT	6.3	0.90	GT	
6BG6G	6.3	0.90	ST-16	
6BQ6GT	6.3	1.20	GT	
6CD6G	6.3	2.50	ST-16	7500
25AV5GT	25.0	0.30	GT	5500
25BQ6GT	25.0	0.30	GT	

## TV SCANNERS (Vertical)

Type	Ef	If	Style	Gm
6AQ5	6.3	0.45	Min.	4100
				3700
				4200
6BF5	6.3	1.20	Min.	
6BL7GT	6.3	1.50	T-9	
6K6GT	6.3	0.40	GT	1500
				2300
				2100
6S4	6.3	0.60	T-6½	4500
6SL7GT	6.3	0.30	GT	1600
6SN7GT	6.3	0.30	GT	3000
				2600
6V6GT	6.3	0.45	GT	3700
				4100
				3750
6Y6G	6.3	1.25	ST-14	7000
				7100
7C5	6.3	0.45	Lock-in	3700
				4100
				3750
12BH7	12.6	0.30	T-6½	6200
	6.3	0.60		3100

## TRIODES (GENERAL PURPOSE)

Type	Ef	If	Style	μ
1C3	1.4	0.05	Min.	14.5
1E4G	1.4	0.05	GT	14.5
				14.0
1G4GT	1.4	0.05	GT	8.8
1LE3	1.4	0.05	Lock-in	14.5
				14.0
2C22	6.3	0.3	T-9	20.0
6AD5G/GT	6.3	0.30	ST-12/GT	100
6AE5GT	6.3	0.30	GT	4.2
6AF5G	6.3	0.30	ST-12	7.4
6C4	6.3	0.15	Min.	17
				19.5
6C5/GT	6.3	0.30	Metal/GT	20
6F5/GT	6.3	0.30	Metal/GT	100
6J4	6.3	0.40	Min.	55
6J5/GT	6.3	0.30	Metal/GT	20
6K5G/GT	6.3	0.30	ST-12/GT	70
6L5G	6.3	0.15	ST-12	15
				17
6N4	6.3	0.20	Min.	32
6P5	6.3	0.30	GT	13.8
6Q4	6.3	0.48	T-6½	80
6SF5/GT	6.3	0.30	Metal/GT	100
7A4	6.3	0.30	Lock-in	20
7B4	6.3	0.30	Lock-in	100
12A	5.0	0.25	ST-14	8.5
12A4	6.3	0.60	T-6½	20
12E5GT	12.6	0.15	GT	13.8
12F5GT	12.6	0.15	GT	100
12J5GT	12.6	0.15	GT	20
12SF5/GT	12.6	0.15	Metal/GT	100
14A4	12.6	0.15	Lock-in	20
26	1.5	1.05	ST-14	8.3
27, 27S	2.5	1.75	ST-12	9.0
30	2.0	0.06	ST-12	9.3
37	6.3	0.30	ST-12	
40	5.0	0.25	ST-14	
56/56S	2.5	1.00	ST-12	13.8
56AS	6.3	0.40	ST-12	
76	6.3	0.30	ST-12	13.8
V-99	3.3	0.063	T-8	6.6
X-99	3.3	0.063	T-9	6.6
485	3.0	1.25	ST-12	12.5
864	1.1	0.25	T-9	8.2
1230	Special Type 30			
9002	6.3	0.15	Min.	25
XXL	6.3	0.30	Lock-in	25
				30

## TRIODES H.F. — OSCILLATORS H.F.

Single Triodes — Duo Triodes				
Type	Ef	If	Style	Gm
3A5	1.4	0.22	Min.	1800
	2.8	0.11		
6AB4	6.3	0.15	Min.	5500
6BQ7	6.3	0.40	T-6½	6000
6C4	6.3	0.15	Min.	2200
				3100
6F4	6.3	0.225	Acorn	5800
6J4	6.3	0.40	Min.	12000
6J6	6.3	0.45	Min.	5300
6L4	6.3	0.225	Acorn	6400
6R4	6.3	0.20	T-6½	5500
7A4	6.3	0.30	Lock-in	3000
				2600
7E5	6.3	0.15	Lock-in	3000
7F8, 7F8W	6.3	0.30	Lock-in	5200
12AT7	6.3	0.30	T-6½	4000
	12.6	0.15		6600
				5500
14F8	6.3	0.30	Lock-in	5200
19J6	18.9	0.15	Min.	1900
1293	1.4	0.11	Lock-in	1500
1626	12.6	0.25	ST-12	

## SPECIAL PURPOSE TUBES

Type	Ef	If	Style	Use
6AE6G	6.3	0.15	ST-12	
6BN6	6.3	0.3	Min.	Limiter-Disc'r
12BN6	12.6	0.15	Min.	Limiter-Disc'r
5722	4.9	1.6	Min.	For Noise Gen.
X6030	3.0	0.6	Lock-in	For Noise Gen.



# CIRCUIT MODIFICATIONS REQUIRING ADDITIONAL RESISTORS

This article, originally printed in "Sylvania News," covers the essential information service technicians need to know in order to substitute tubes in series strings when either the voltage or current is different from that of the original tube type.

**S**ERVICE technicians should have little trouble making tube substitutions in AC-DC sets as long as the substitute tube operates on the same current as the original tube. If the voltage is different, a slight change in the series resistor will be required. However, when the tube current is either higher or lower, the resistor changes are more complicated. The principles involved for both cases are explained in the following examples which can be applied to any substitution desired.

Fig. 1 shows a typical 300 ma. filament string including a series resistance of approximately 150 ohms exclusive of the tapped section. The resistor is shown as a tapped resistor since in many cases ballast resistors with the tap

were used. In this case the pilot lamp rating will be less than 300 ma. Many receivers were built in which a 300 ma. pilot lamp was employed and no resistance was shunted across it. For those cases the resistor shunting the pilot light in Fig. 1 may be considered to be open.

Let us now suppose that the 25L6GT/G tube has burned out and that it is impossible to obtain another output tube of this type. Assume that the only power output tube obtainable is the 50L6GT. This tube requires only 150 ma. and, therefore, we must shunt the filament with a resistance which will by-pass 150 ma. of the total heater current. This will require a resistance of 333 ohms. A 300 ohm resistor will be perfectly satisfactory in this application. Originally the total voltage drop across the tubes was 68.9 volts leaving 48.1 volts drop across the series resistor. In the revised circuit the total voltage drop across the filaments of the tubes for proper operation will now be 93.9 volts. This means, therefore that the series resistor must be reduced in value to approximately 80 ohms in order that 300 ma. will flow through the filament string. This series resistor may be in the form of a line cord or actually may be a resistor mounted in the receiver itself. If it is in the line cord, a resistor of from 150 to 175 ohms may be shunted across the cord provided room may be found to locate this resistor. This resistor will, of course, become quite warm and must be placed in such a position that the added heat from the resistor will not cause wax in condensers to melt. If the resistor is mounted in the receiver to begin with, and if a 75 to 80 ohm resistor of the same physical size can be obtained, then it should be substituted for the one which was originally in the receiver.

The same general procedure must be followed if we wish to replace any one of the other tubes in the string with a 150 ma. tube. Fig. 2 illustrates in heavy lines the changes which must be made.

To summarize, there are three things which must be done in making a change of this kind:

1. The filament of the 150 ma. tube must be shunted.

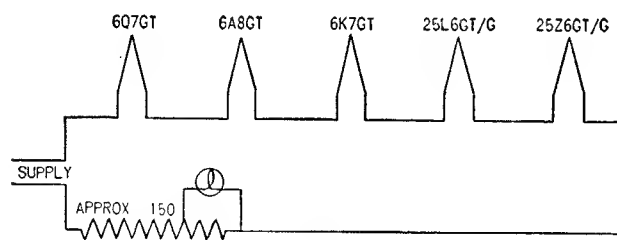


FIG. 1

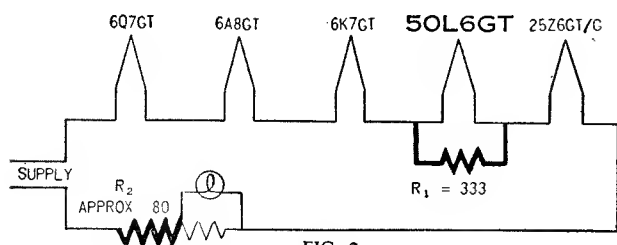


FIG. 2

$$R1 = \frac{\text{Filament Volts of 150 ma. tube}}{.150}$$

$$R2 = \frac{120 \text{ minus sum of tube voltages}}{.300}$$

2. The series resistor must be reduced in value so that 300 ma. is still available for the filament string.

3. These resistors must be located in such a place that the added heat will not cause trouble.

Let us now consider the filament string shown in Fig. 3. A great many more receivers are on the market employing a circuit similar to the one shown. This differs from the circuit shown in Fig. 1 in that no series resistor is employed and that the pilot light is lighted from a tap on the 35Z5GT/G filament.

No series resistor is necessary since the sum of the voltages required across the entire filament string is 122.8 volts. A receiver with such a circuit comes in to be repaired and the 50L6GT has an open filament. Let us assume that the only output type available from the jobber is a type 25L6G. This tube requires 300 ma.

resistor. If the tube which has to be replaced is located at either end of the filament string such as the 35Z5GT/G or the 12SQ7GT/G in Fig. 3, then only one shunting resistor would be required. The biggest problem may very well be to find a place for the three resistors which will be required in most instances.

The power dissipated in these resistors will be considerable and precautions must be observed to prevent the heat developed from causing damage to the receiver. The wattage dissipated by a receiver changed over in the manner indicated in Fig. 4 dissipates twice the wattage that the receiver originally was designed for and all of that heat must be gotten rid of so that permanent damage to condensers and other parts in the receiver will not result. As in Fig. 2, the final changes are indicated in Fig. 4 with heavy lines.

The wattage rating of the resistors required in these circuits is found by multiplying the resistor current in amperes by the voltage across the resistor.

$$W = E \cdot I$$

Thus in the example shown as figures 3 and 4 the watts dissipated in R1 will be

$$37.8 \times .150 = 5.7 \text{ Watts}$$

37.8 comes from 3 tubes at 12.6 volts each, and the .150 amperes is the current through the resistor, another .150 amperes flows through the tubes.

Similarly the watts dissipated in R3 will be

$$25 \times .300 = 7.5 \text{ Watts}$$

The wattage rating of a resistor is the amount it can safely dissipate in the open air.

Unfortunately it is nearly always impossible to place these resistors in the open, and for use in confined spaces, like under the chassis, a factor of safety of at least 2 and preferably 3 is necessary, making the above values 15 and 20 Watts respectively.

To summarize, when a 300 ma. tube is used to replace a 150 ma. tube, there are three things which must be observed:

1. Shunt resistors must be added to the 150 ma. tubes in the receiver so that the tube which is being used as a replacement can obtain its full 300 ma.
2. A series resistor which will carry 300 ma. must be added to restore the voltage distribution across the filament string to its original value.
3. The series and shunt resistors must be placed in such a manner that the additional heat now developed in the receiver will not cause permanent damage.

Obviously there are many changes which may have to be made in equipment other than those indicated but the examples given were chosen as typical ones which you no doubt will have to make in the future. It is hoped that these suggestions will save you time in keeping your customers' receivers in condition.

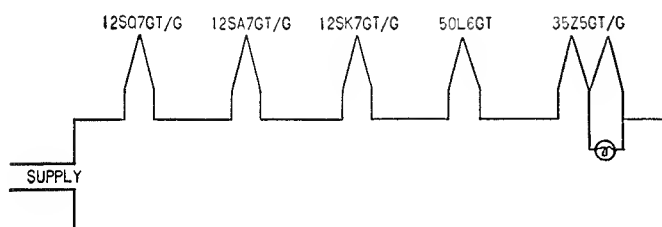


FIG. 3

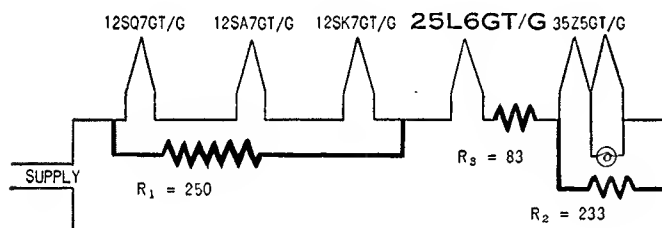


FIG. 4

$$R1 \text{ or } R2 = \frac{\text{Sum of tube voltages across resistor}}{.150}$$

$$R3 = \frac{\text{Old tube volts} - \text{new tube volts}}{.300}$$

filament current. However, it can be employed provided we rewire the circuit in such a manner that 300 ma. can be supplied to the filament of the 25L6GT/G. This can be accomplished by shunting the three 12-volt tubes with a 250 ohm resistor as shown in Fig. 4 and by shunting the 35Z5GT/G with a 233 ohm resistor (250 ohms would be satisfactory).

The sum of the voltages across all of the filaments now adds up to 97.8 volts, therefore, a series resistor must be added to the string so that the total will add up to approximately the line voltage. The value of this resistor should be approximately 83 ohms. This resistor may be added at any place in the string but it must be added in such a position that the total 300 ma. flows through that

# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 13		NO CHANGES	FL. VOLTS	FL. CURRENT	REWIRE SOCKET	CHANGE SOCKET	REALIGN	ADD CONNECTION	REMOVE TOP CAP	CHANGE BITS	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
1A4 (P or T)...	1A4 (P or T)...	A									
	1D5G					E	F				
	1E5G (P)...					E	F				
	1LN5		B	C		E	F		H		1
	1N5GT		B	C		E	F				1
	1LC5		B	C		E	F		H		1
	1T4		B	C		E	F		H		1
	1L4		B	C		E	F		H		
	34						F				
	32						F				1
1A5GT	1LA4					E					8
	1LB4					E					K
	1T5GT										2
	1N6G				D						K
	1C5GT										K
	1Q5GT			C							2
	1W4					E					2
	3Q5GT			C	D						2
	3D6			C		E					2
	3Q4			C		E					2
	3S4			C		E					2
	3V4			C		E					2
	1S4			C		E					2
	3LF4			C		E					2
1A6	1C6			C			F				
	1D7G					E	F				
	1C7G					E	F				
	1A7GT		B	C		E	F		H	K	
	1LA6		B	C		E	F		H	K	
	1LC6		B	C		E	F		H	K	
1A7GT	1L6					E	F		H		
	1LC6					E	F		H		6
	1LA6					E	F		H		
	1B7GT			C			F				
	1D8GT			C	D		F				9
	3A8GT			C	D		F				9
	1R5					E	F		H		11
1B4 (P or T)...	32						F				
	1E5G (P or T)...					E	F				
	1LN5		B	C		E	F		H		
	1LC5		B	C		E	F		H		
	1T4		B	C		E	F		H		
	1N5GT					E	F				
	1P5GT					E	F				
1B7GT	1A7GT			C			F				
	1LC6			C		E	F				6
	1LA6			C		E	F				
	3A8GT			D			F				9
1B8GT	1S5										
	1W4										
	1U5										
	1W4										
1C5GT	1A5GT			C							2
	1LA4			C		E					2
	1LB4			C		E					2
	1Q5GT										
	1S4			C		E					
	1T5GT										2
	1W4					E					2
	3D6			C		E					
	3LF4			C		E					
	3Q4					E					
	3Q5GT			D							
	3S4					E					
	3V4					E					
1C6	1A6			C			F				
	1C7G					E	F				

For details of changes indicated Refer to page 13		NO CHANGES	FL. VOLTS	FL. CURRENT	REWIRE SOCKET	CHANGE SOCKET	REALIGN	ADD CONNECTION	REMOVE TOP CAP	CHANGE BITS	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
1C6	1D7G			C		E	F				
(Continued)	1A7GT		B	C		E	F		H	K	
	1LA6		B	C		E	F		H	K	
	1B7GT		B	C		E	F		H	K	
	1LC6		B	C		E	F		H	K	6
1C7G	1A6			C		E	F				
	1C6					E	F				
	1D7G			C			F				
	1A7GT		B	C			F		K		
	1LA6		B	C		E	F		K		
	1B7GT		B	C			F		K		
	1LC6		B	C		E	F		K		6
1D5G (P or T)...	1A4 (P or T)...					E	F				
	34					E	F				
	1N5GT		B	C			F		K		1
	1E5G (P or T)...						F				1
	1B4 (P or T)...						F				1
	32						F				1
	1P5GT		B	C			F				
	1LN5		B	C		E	F		H	K	1
	1LC5		B	C		E	F		H	K	6-1
1D7G	1A6					E	F				
	1C7G			C			F				
	1C6			C		E	F				
	1A7GT		B				F		K		
	1LA6		B	C		E	F		H	K	
	1B7GT		B	C			F		K		
	1LC6		B	C		E	F		H	K	6
1D8GT	1N6G										
	1E4G										
	1LB4										
	1LH4										
	1C3										
	1W4								H		5
1E4G	1G4GT										K
	1LE3					E					K
	1N5GT				D			G			4
1E5G (P or T)...	1B4					E	F				
	32					E	F				
	1N5GT		B	C			F		K		
	1D5G (P or T)...						F				1
	1A4 (P or T)...					E	F				1
	34					E	F				1
	1LN5		B	C		E	F		H	K	
	1LC5		B	C		E	F		H	K	6
1E7G	2 type 1F5G... requires room for 2 sockets,										
	2 type 1F4... no single type.										
	2 type 1S4		B	C							K
	2 type 1W4		B	C							K
1F4	1F5G					E					
	33			C							2
	1G5G					E					2
	1A5GT		B	C		E					2
	1C5GT		B	C		E					2
	1Q5GT		B	C		E					2
	1LB4		B	C		E					2
	3D6		B	C		E					2
	3LF4		B	C		E					2
1F5G	1F4					E					
	33					E					
	1G5G										K
	1A5GT		B	C							K
	1C5GT		B	C							K
	1Q5GT		B	C							K
	1LB4		B	C							K
	3D6		B	C							K

The G, GT or GT/G Types may be used interchangeably when space permits.

# BATTERY TUBE TYPES

For details of changes indicated Refer to page 13		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD TOP CAP REMOVE TOP CAP CHANGE BASE OR PLATE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
1F5G.....	1J5G.....									K	
(Continued)	3LF4.....	B	C		E					K	2
1F6.....	1F7G.....					E	F				
	3A8GT.....	B	C		E	F				K	
	1S5.....	B	C		E	F				K	
	1LD5.....	B	C		E	F				K	
1F7G.....	1F6.....					E	F				
	3A8GT.....	B	C	D		F				K	9
	1S5.....	B	C		E	F				K	
	1LD5.....	B	C		E	F				K	
1G4GT.....	1E4G.....									K	
	1LE3.....				E					K	
1G5G.....	1F5G.....									K	2
	1F4.....				E					K	2
	33.....				E					K	2
	1T5GT.....	B	C							K	2
	1A5GT.....	B	C							K	2
	1C5GT.....	B	C							K	
	1Q5GT.....	B	C							K	
	1LA4.....	B	C		E					K	2
	1LB4.....	B	C		E					K	2
	3D6.....	B	C		E					K	
	3LE4.....	B	C		E					K	2
	3LF4.....	B	C		E					K	
	3Q5G.....	B	C	D						K	
	1J5G.....	A									
1G6GT.....	1J6G.....	B	C								
	19.....	B	C		E						
	3B7.....	B	C		E						
1H4G.....	30.....					E					
	1E4G.....	B	C							K	
	1G4GT.....	B	C							K	
	1LE3.....	B	C		E					K	
1H5GT.....	1C3.....					E			H		5
	1H6G.....	B	C	D					H	K	
	1LH4.....					E			H		8
	3A8GT.....			D					H		9
	1LD5.....					E			H		3
1H6G.....	1B5.....					E					
	1H5GT.....	B	C							K	5
	1LH4.....	B	C			E				K	5
	3A8GT.....			D						K	9-5
1J5G.....	1G5G.....	A									
	1F5G.....									K	
	1F4.....				E					K	
	33.....				E					K	
	1A5GT.....	B	C							K	2
	3LF4.....	B	C		E					K	2
	1C5GT.....	B	C							K	2
	1Q5GT.....	B	C							K	2
	3Q5GT.....	B	C	D						K	
	3D6.....	B	C		E					K	2
	1D8GT.....	B	C							K	9
	1T5GT.....	B	C							K	
1J6G.....	19.....					E					
	1G6G.....	B	C								
	3B7.....	B	C		E						
1L4.....	1T4.....						F				1
	1U4.....						F				1
	1AF4.....		C				F				
1L6.....	1R5.....				D		F				11-6
	1LA6.....					E	F				
	1LC6.....					E	F				

For details of changes indicated Refer to page 13		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD TOP CAP REMOVE TOP CAP CHANGE BASE OR PLATE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
1LA4.....	1A5GT.....					E					
	1C5GT.....			C		E				K	2
	1Q5GT.....			C		E					2
	1D8GT.....			C		E				K	9-2
	3D6.....			C							2
	3Q5GT.....			C		E					2
	1LB4.....									K	2
	3LF4.....			C	D						2
1LA6.....	1A7GT.....					E	F		H		
	1LC6.....						F				6
	3A8GT.....			C		E	F				9-2
1LB4.....	1LA4.....									K	2
	3D6.....			C	D					K	
	3LE4.....			C	D						2
	3LF4.....			C	D					K	2
	1T5GT.....					E				K	
	1A5GT.....					E					
	1C5GT.....			C		E				K	2
	1S4.....			C		E				K	2
	1W4.....					E					
	3V4.....			C		E				K	
	3Q4.....			C		E				K	
1LC5.....	1LN5.....						F			K	
	1L4.....					E	F				
	1N5GT.....					E	F				7
	1U4.....					E	F				
	1LG5.....					E	F				
	3A8GT.....			C		E	F				9-7
	5910.....					E	F				
1LC6.....	1A7GT.....					E	F				7
	1LA6.....						F				7
	1L6.....					E	F				
	1R5.....					E	F				11
	3A8GT.....			C		E	F	G			9
1LD5.....	1S5.....					E	F				
	1D8GT.....			C		E	F			K	9-7
	1N6G.....					E	F			K	7
	1U5.....					E					
	1L4.....					E					5
	3A8GT.....			C		E	F				9-7
1LE3.....	1G4GT.....					E				K	
	1E4G.....					E					
	1D8GT.....					E				K	9
	1C3.....					E					
	1L4.....					E					4
1LH4.....	1H5GT.....					E					
	3A8GT.....					E					9
	1LN5.....				D						3
1LN5.....	1N5GT.....					E	F				
	1LC5.....						F				6
	1L4.....					E	F			K	
	1U4.....					E	F				
	3A8GT.....			C		E	F				9
1N5GT.....	1T4.....					E	F		H		8
	1L4.....					E	F		H		
	1LN5.....					E	F		H		8
	1LC5.....					E	F		H		6
	1U4.....					E	F		H		
	3A8GT.....			D		F					9
1N6G.....	1A5GT.....				D						5
	1D8GT.....			C	D						9
	1LA4.....					E					5
	1LB4.....					E			K		5-2
	1Q5GT.....			C	D						5-2
	1T5GT.....				D						5-2
	1W4.....					E			K		5-2

The G, GT or GT/G Types may be used interchangeably when space permits.

**Refer to page 13**

For details of changes indicated											
Refer to page 13											

**The G, GT or GT/G Types may be used interchangeably when space permits.**

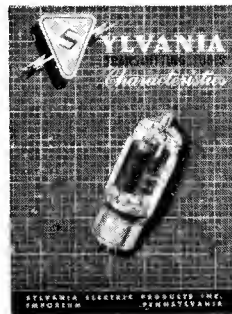
## NOTES FOR BATTERY TUBE SUBSTITUTIONS

- A. This is shown only when the tubes are directly interchangeable for all published ratings. Unusual operating conditions may require analysis.
  - B. This means that the filament voltage on the substitute tube is different from the required type. In most cases this can be allowed for by use of a small resistor to drop the voltage to that required. In some cases a complete change over of all tubes so as to use a new supply may be advisable. No listing is made for 2.0 volt tubes replacing 1.4 volt tubes because the additional battery and best circuit changes must be determined for each case.
  - C. Indicates that the filament current of the substitute tube differs from that of the required type. If all tubes are used directly from the battery this will affect battery life only, but in many cases a series resistor or ballast may have to be changed, adjusted, or shunted. If in series on an AC-DC set a substitute with no change in current is required.
  - D. Uses the same socket but pin connection is different. Watch out for tie points not used in the former tube which may be used in the substitute tube.
  - E. Requires a different type of socket. Watch out for tie points as in "D".
  - F. Realignment is recommended as good practice in all cases of RF and IF changes.
  - G. Provision must be made for connection to the top cap of the substitute tube which was not originally required.
  - H. The former top cap connection will have to be changed to connect to a base pin or to the side of the adapter when one is used.
  - K. Indicates that the substitute tube operates at a different bias for the applied plate voltage than the original tube. If some of the newer types are substituted good performance and improved battery life can be obtained by reducing the plate voltage to the rating of the new tube and applying its rated bias.
- (1) The use of a sharp cut-off RF pentode in place of a remote cut-off tube may cause great distortion in locations where strong signals are available. If no other substitute is available all tubes on the A.V.C. system should be changed.
  - (2) The optimum load resistance for these types is more than 20% off. If tone is noticeably poor, transformer tap adjustment or a new transformer may be required.
  - (3) Requires addition of screen voltage, resistor and bypass condenser. Select resistor to give screen volts approximately equal to the actual plate volts.
  - (4) This type can be used as a triode by tying screen and suppressor to the plate.
  - (5) A type 1N34 crystal may be used in place of one diode section of the original tube.
  - (6) If voltage at screen is greater than rated value it should be reduced.
  - (7) Screen voltage may be increased for use with this type.
  - (8) Circuit for this substitution is given on last few pages of this booklet.
  - (9) Unused elements should be tied to negative filament.
  - (10) Decrease screen voltage when using this type.
  - (11) This converter substitution is tricky. Some experimentation may be required to find the best connection for each set. Adaptor circuits in the back of this book may help.
- The G, GT, or GT/G types may be used interchangeably where space permits.



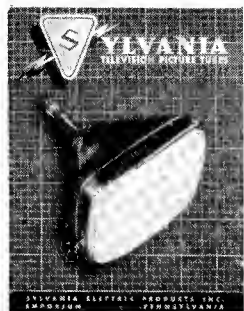
### 211 Receiving Tubes Characteristics Folder

Characteristics of Sylvania tubes and panel lamps with tube base views. **FREE**



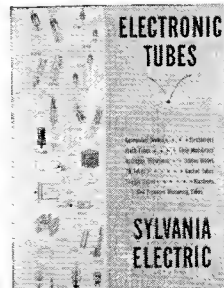
### 213 Transmitting Tubes Characteristics Folder

Characteristics of Sylvania tubes used in amateur and commercial transmitters with tube and base diagrams. **FREE**



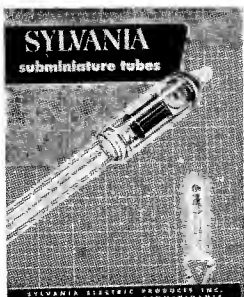
### 216 Television Tubes Characteristics Folder

Characteristics of television picture tubes and general purpose cathode ray tubes with base diagrams. **FREE**



### 217 Electronic Tubes Booklet

The latest word on the newest developments in the most modern field of science. Contains characteristics on germanium and silicon crystal diodes, strobosons, flash tubes, gas pressure measuring and switching tubes, selenium rectifiers, hydrogen thyatrons, rocket tubes and others. **FREE.**



### 221 Subminiature Characteristics Folder

Characteristics of Sylvania Subminiature Tubes with tube and base diagrams. **FREE**

Recent developments in Television and AM-FM radios have necessitated many new tube types. It is Sylvania's policy to provide our service dealer customers with the latest information on new electronic developments.

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# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		<div>NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION CAP. COUPLING OR PLATE CONNECTION CHANGE BIAS VOLTS NOTE NO.</div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6D8G.....	7A8.....					E	F		H		
	14J7.....		B			E	F		H		
	14S7.....		B			E	F		H		
	14B8.....		B			E	F		H		
	12A8GT.....		B				F				
	12K8GT.....		B				F				
	25B8GT.....		B		D		F			11	
For 300 ma. types see type 6A8G and for procedure see article on page 8.											
6G6G.....	12L8GT.....		B		D						
	14A5.....		B			E			K	2	
	35A5.....		B			E			K	2	
	35L6GT.....		B						K	2	
	50A5.....		B			E			K	2	
	50L6GT.....		B						K	2	
	50C6G.....		B						K	2	
For 300 ma. types see type 12A5 and for procedure see article on page 8.											
6L5G.....	12J5GT.....		B								
	14A4.....		B			E					
	14E6.....		B			E				9	
	12J7GT.....		B		D			G		4	
	12SJ7GT.....		B		D					4	
	7C7.....					E				4	
	14C7.....		B			E				4	
	6W7G.....				D			G		4	
For 300 ma. types see type 6C5G and for procedure see article on page 8.											
6S7G.....	6SS7.....				D		F		H		
	12SK7GT.....		B		D		F		H		
	12K7GT.....		B				F				
	7B7.....					E	F		H	6	
	14A7/12B7.....		B			E	F		H	6	
	14E7.....		B			E	F		H		
	14H7.....		B			E	F		H	6	
	12J7GT.....		B				F			1	
	12SJ7GT.....		B		D		F		H	1	
	7C7.....					E	F		H	1	
	14C7.....		B			E	F		H	1-6	
For 300 ma. types see type 6K7G and for procedure see article on page 8.											
6T7G.....	12Q7GT.....		B								
	12SQ7GT.....		B		D				H		
	7C6.....					E			H		
	14B6.....		B			E			H		
	14E7.....		B			E			H	3	
	14R7.....		B			E			H	3	
	12SF7.....		B		D				H	3	
	12C8.....		B		D					3	
For 300 ma. types see type 6Q7GT and for procedure see article on page 8.											
6W7G.....	12J7GT.....		B				F				
	12SJ7GT.....		B		D		F		H		
	12SH7.....		B		D		F		H	6	
	7C7.....					E	F		H		
	14C7.....		B			E	F		H		
	12C8.....		B		D		F			9	
	14R7.....		B			E	F		H	9	
For 300 ma. types see 6J7GT and for procedure see article on page 8.											
For use as audio amplifiers types under 6S7G may also be used.											
7A6.....	12AL5.....		B			E					
	12H6G.....		B			E					
	14F7.....		B		D					4	
	12SL7GT.....		B			E				4	

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION CAP. COUPLING OR PLATE CONNECTION CHANGE BIAS VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
7A6.....	XXD.....		B		D						4
(Continued)	14AF7.....		B		D						4
	5679.....				D						
For 300 ma. types see 6H6GT and for procedure see article on page 8.											
7A8.....	14B8.....		B				F				
	14J7.....		B				F				
	14S7.....		B				F				
	12A8GT.....		B				F	G			
	12K8GT.....		B				F	G			
	6D8G.....					E	F	G			
	25B8GT.....		B			E	F	G			11
For 300 ma. types see 6A8GT and for procedure see article on page 8.											
7B7.....	7AH7.....						F			K	
	14A7/12B7.....		B				F				
	14H7.....		B				F				6
	6BJ6.....					E	F			K	
	6S7G.....					E	F	G			
	6SS7.....					E	F				
	12SG7.....		B			E	F				6
	12SK7G.....		B			E	F				
	12K7GT.....		B			E	F	G			
	5590.....					E	F				
	9001.....					E	F				
For 300 ma. types see 6K7GT and for procedure see article on page 8. See also types under 7C7 and note 1.											
7C6.....	6AQ6.....					E					
	6SZ7.....					E					
	6T7G.....					E		G			
	12AX7.....		B			E					5
	12BK6.....		B			E					
	12BT6.....		B			E					
	12F5GT.....		B			E		G			5
	12Q7GT.....		B			E		G			
	12SF5GT.....		B			E					5
	12SQ7GT.....		B			E					
	14B6.....		B								
For 300 ma. types see 6Q7GT and for procedure see article on page 8.											
7C7.....	6BH6.....					E	F			K	
	6W7G.....					E		G			
	7AB7.....				D		F				
	7AG7.....					F				K	
	12AU6.....		B			E	F			K	
	12C8.....		B			E		G			9
	12J7GT.....		B			E		G			
	12SH7G.....		B			E					6
	12SJ7GT.....		B			E					
	14C7.....		B								
	14R7.....		B		D						9
	5879.....					E	F			K	
For 300 ma. types see 6J7GT and for procedure see article on page 8.											
For use in audio amplifiers types under 7B7 may also be used.											
12A8GT.....	7A8.....		B			E	F		H		8
	12K8GT.....					F					11
	6D8G.....		B			F					11
	14B8.....					E	F		H		8
	14J7.....					E	F		H		8
	14S7.....					E	F		H		8
	25B8GT.....		B			E	F				8
For 300 ma. types see 6A8GT and for procedure see article on page 8.											

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# 150 MA. SERIES HEATER TYPES

For details of changes indicated Refer to page 1B		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION CAP. TOP CONNECTION OR. PLATE TOP CONNECTION CHANGE WTS. CHANGE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
12BA6.....	6BJ6.....	B	D		F						
	7AH7.....	B			E	F			K		
	12BD6.....				F				K		
	12SG7.....				E	F			K		
	12K7GT.....				E	F	G		K		
	12SK7GT.....				E	F			K		
	14A7.....				E	F			K		
	14H7.....				E	F			K		
12BE6.....	6D8G.....	B			E	F	G			11	
	12BA7.....				E	F					
	12K8GT.....				E	F	G			11	
	12SA7GT.....				E	F					
	12SY7.....				E	F					
	14B8.....				E	F				11	
	14J7.....				E	F				11	
	14Q7.....				E	F					
	14S7.....				E	F				11	
12C8.....	12SF7.....			D		F		H	K		
	14E7.....				E	F		H			
	14R7.....				E	F		H	K		
For 300 ma. types see 6B8G and for procedure see article on page 8.											
12F5GT.....	6T7G.....	B	D							9	
	7C6.....	B			E			H		9	
	12SF5GT.....		D					H			
	12SL7GT.....		D					H		9	
	12Q7GT.....		D							9	
	12SQ7GT.....		D					H		9	
	14B6.....				E			H		9	
For 300 ma. types see 6F5GT and for procedure see article on page 8.											
12J5GT.....	6C4.....	B			E						
	6L5G.....	B									
	6W7G.....	B	D		G					4	
	7C7.....	B			E					4	
	12BF6.....				E					4	
	12BU6.....				E					4	
	12J7GT.....		D		G					4	
	12SJ7GT.....		D							4	
	14A4.....				E						
	14C7.....				E					4	
	14E6.....				E					9	
	9002.....	B			E			K			
For 300 ma. types see 6J5GT and for procedure see article on page 8.											
12J7GT.....	6BH6.....	B			E	F	G		K		
	6W7G.....	B				F					
	7AG7.....	B			E	F	G		K		
	7C7.....	B			E	F		H		8	
	12AU6.....				E	F	G		K		
	12AW6.....				E	F	G		K		
	12C8.....		D		F					9	
	12SH7G.....		D		F			H		6	
	12SJ7GT.....		D		F			H			
	14C7.....				E	F		H		8	
	14R7.....				E	F		H		9	
	5879.....	B			E	F	G		K		
	9003.....	B			E	F	G		K		
For 300 ma. types see 6J7GT and for procedure see article on page 8. For use as audio amplifier types under 12K7G may also be used.											
12K7GT.....	6BJ6.....	B			E	F		H	K		
	6S7G.....	B				F					
	6SS7.....	B	D		F			H			
	7AH7.....	B			E	F		H	K		

For details of changes indicated Refer to page 1B		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION CAP. TOP CONNECTION OR. PLATE TOP CONNECTION CHANGE WTS. CHANGE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
12K7GT.....	7B7.....	B				E	F		H		
(Continued)	12BA6.....					E	F		H	K	
	12BD6.....					E	F		H	K	
	12SG7.....		D			F			H	K	
	12SK7G.....		D			F			H		
	14A7/12B7.....					E	F		H		8
	14E7.....					E	F		H		9
	14H7.....					E	F		H		8-6
	25B8GT.....	B	D			F					9
	5590.....					E	F		H		
	9001.....					E	F		H	K	
For 300 ma. types see 6K7G and for procedure see article on page 8. See also types under 12J7GT and note 1.											
12K8GT.....	7A8.....	B				E	F		H		8
	12A8GT.....					F					11
	14J7.....					E	F		H		8
	14S7.....					E	F		H		11
	6D8G.....	B				F					11
	25B8GT.....	B	D			F					11
	14B8.....					E	F		H		8
For 300 ma. types see type 6K8G and for procedure see article on page 8.											
12Q7GT.....	6AQ6.....	B				E			H		
	6T7G.....	B									
	7B4.....	B				E			H		5
	7C6.....	B				E			H		8
	12AT6.....					E			H		
	12AV6.....					E			H		
	12BK6.....					E			H		
	12BT6.....					E			H		
	12F5GT.....		D								5
	12SF5GT.....		D						H		5
	12SF7.....		D						H		3
	12SQ7GT.....		D						H		
	14B6.....					E			H		8
	14E7.....					E			H		
	14R7.....					E			H		
	14X7.....					E			H		
For 300 ma. types see type 6Q7GT for procedure see article on page 8.											
12SA7GT.....	6D8G.....	B	D			F	G				11
	7A8.....	B				E	F				11
	12A8GT.....		D			F	G				11
	12K8GT.....		D			F	G				11
	14B8.....					E	F				11
	14J7.....					E	F				11
	14Q7.....					E	F				8
	14S7.....					E	F				11
For 300 ma. types see type 6SA7 and for procedure see article on page 8.											
12SF5GT.....	6T7G.....	B	D					G			
	7C6.....	B				E					
	12F5GT.....		D					G			
	12Q7GT.....		D					G			
	12SL7GT.....		D								
	12SQ7GT.....		D								
	14B6.....					E					
For 300 ma. types see type 6SF5 and for procedure see article on page 8.											
12SG7.....	6BJ6.....	B				E	F				
	7AH7.....	B				E	F				
	12BA6.....					E	F				
	12BD6.....					E	F				
	14H7.....					E	F				

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.



# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		<div>NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADJUST CONNECTION CAP. CONNECTION REWORK CONNECTION CHANGE BIAS OR PLATE VOLTS NOTE NO.</div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
12SJ7GT.....	6BH6.....		B			E	F			K	
	6W7G.....		B		D		F	G			
	7AG7.....		B			E	F			K	
	7C7.....		B			E	F			8	
	12AU6.....					E	F			K	
	12AW6.....					E	F			K	
	12C8.....				D		F	G			
	12J7GT.....				D		F	G			
	12SH7G.....				D		F			6	
	14C7.....					E	F			8	
	14R7.....					E	F				
	5879.....					E	F			K	
	9003.....					E	F				
For use in audio amplifier types under 12SK7GT may also be used.											
For 300 ma. types see type 6SJ7G and for procedure see article on page 8.											
12SK7GT.....	6BJ6.....		B			E	F			K	
	6S7G.....		B				F	G			
	6SS7.....		B				F				
	7AH7.....		B			E	F			K	
	7B7.....		B			E	F				
	12BA6.....					E	F			K	
	12B7/14A7.....					E	F			8	
	12BD6.....					E	F			K	
	12K7GT.....				D		F	G			
	12SG7.....				D		F			K 6	
	14E7.....					E	F				
	14H7.....					E	F			8	
	5590.....					E	F				
	9001.....					E	F			K	
See also types under 12SJ7 and note 1.											
For 300 ma. types see type 6K7G and for procedure see article on page 8.											
12SQ7GT.....	6AQ6.....		B			E					
	6T7G.....		B		D			G			
	7B4.....		B			E				5	
	7C6.....		B			E					
	12AT6.....					E					
	12AV6.....					E					
	12BK6.....					E					
	12BT6.....					E					
	12F5GT.....				D		G			5	
	12Q7GT.....				D		G				
	12SF5GT.....				D					5	
	12SF7.....				D					3	
	14B6.....					E				8	
	14E7.....					E					
	14R7.....					E					
	14X7.....					E					
For 300 ma. types see type 6Q7GT and for procedure, see article on page 8.											
12SR7GT.....	6C4.....		B			E				5	
	6L5G.....		B		D					5	
	6ST7.....		B								
	12BF6.....					E					
	12C8.....					E	G			4	
	12E5GT.....				D					K 5	
	12SF7.....					E				4	
	14E6.....					E					
For 300 ma. types see type 6R7G and for procedure see article on page 8.											
14A4.....	6L5G.....		B			E					
	6ST7.....		B			E					
	12J5GT.....					E					
	12SR7.....					E					
	14E6.....				D					9	
For 300 ma. types see type 6J5G and for procedure see article on page 8.											

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADJUST CONNECTION CAP. CONNECTION REWORK CONNECTION CHANGE BIAS OR PLATE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
14A5.....	12A6.....					E					
	35A5.....		B							K 2	
	50A5.....		B							K 2	
	50C6G.....		B			E				K 2	
	6G6G.....		B			E				K 2	
	35L6GT.....		B			E				K 2	
	50L6GT.....		B			E				K 2	
For 300 ma. types see type 12A5 and for procedure see article on page 8.											
14A7.....	7B7.....		B				F				
	14H7.....						F			6	
	6S7G.....		B			E	F	G			
	6SS7.....		B			E	F				
	12SK7GT.....					E	F				
	12SG7.....					E	F			6	
	12K7GT.....					E	F	G			
For 300 ma. types see type 6K7GT and for procedure see article on page 8.											
14B6.....	7C6.....		B								
	6T7G.....		B			E		G			
	12C8.....					E		G		3	
	12Q7GT.....					E		G			
	12SF7.....					E				3	
	12SQ7GT.....					E					
For 300 ma. types see type 6Q7GT and for procedure see article on page 8.											
14B8.....	7A8.....		B				F				
	14J7.....						F				
	14S7.....						F				
	12A8GT.....					E	F	G			
	12K8GT.....					E	F	G			
	25B8GT.....		B			E	F	G		11	
	6D8G.....		B			E	F	G			
For 300 ma. types see type 6A8GT and for procedure see article on page 8.											
14C7.....	7C7.....		B								
	6W7G.....		B			E		G			
	12SH7.....					E				6	
	12SJ7GT.....					E					
	12J7GT.....					E		G			
For use as audio amplifiers see also types under 14A7.											
For 300 ma. types see type 6J7GT and for procedure see article on page 8.											
14E6.....	6C4.....		B			E				5	
	6L5G.....		B			E				5	
	6ST7.....		B			E					
	12BF6.....					E					
	12C8.....					E		G		4	
	12E5GT.....					E			K	5	
	12SF7.....					E				4	
	12SR7.....					E					
For 300 ma. types see type 6V7G and for procedure see article on page 8.											
14J7.....	6D8G.....		B			E	F	G			
	7A8.....		B				F				
	12A8GT.....					E	F	G			
	12B8GT.....					E	F	G			
	12K8GT.....					E	F	G			
	14B8.....						F				
	14S7.....						F				
For 300 ma. types see type 6A8G and for procedure see article on page 8.											

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

## -150 MA. SERIES HEATER TYPES-

For details of changes indicated Refer to page 18												
		NO CHANGES	FIL. VOLTS	FIL. CURRENT	REWIRE SOCKET	CHANGE SOCKET	REALIGN	CAPACITOR CONNECTION	GRID TOP CAP	OR PLATE TOP VOLTAGE	CHANGE WIRING	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K		
14Q7.....	6D8G.....		B.....			E	F	G.....			11	
	7A8.....		B.....	D.....			F.....				11	
	12A8GT.....					E	F	G.....			11	
	12BA7.....					E	F.....					
	12BE6.....					E	F.....					
	12K8GT*.....					E	F	G.....			11	
	12SA7GT*.....					E	F.....					
	12SY7.....					E	F.....					
	14B8.....				D.....		F.....				11	
	12SY7.....					E	F.....					
	14B8.....				D.....		F.....				11	
	14J7.....				D.....		F.....				11	
	14S7.....				D.....		F.....				11	
For 300 ma. types see type 6SA7 and for procedure see article on page 8.												
14R7.....	7B7.....		B.....	D.....							5	
	7C7.....		B.....	D.....							5	
	12C8.....					E.....	G.....		K.....			
	12SF7.....					E.....			K.....			
	14A7.....			D.....							5	
	14C7.....			D.....							5	
	14E7.....								K.....			
	14H7.....			D.....							5	
For 300 ma. types see type 6B8G and for procedure see article on page 8.												
25B8GT.....	No good single tube; Types 12SF5 and 12K7G together.											
	12B8GT.....		B	C.....		F.....						
	6P7G.....		B	C D.....		F.....		K.....				
	6F7.....		B	C.....		E	F.....	K.....				
	12AT6 and { ..Use adaptor					F.....	H.....		9			
	12BA6 { ..with 2 Min. Sockets											
	12AV6 and { ..Use adaptor					F.....	H.....		9			
	12BD6 { ..with 2 Min. Sockets											
	12BK6 and { ..Use adaptor					F.....	H.....		9			
	12BA6 { ..with 2 Min. Sockets											
	12BT6 and { ..Use adaptor					F.....	H.....		9			
	12BD6 { ..with 2 Min. Sockets											
25D8GT.....	12AT6 and { ..Use adaptor					F.....	H.....		9			
	12BA6 { ..with 2 Min. Sockets											
Others same as 25B8GT using one of the diodes												
35A5.....	12A6.....		B.....			E.....			K.....		2	
	14A5.....		B.....						K.....		2	
	50A5.....		B.....									
	35B5.....					E.....						
	50B5.....		B.....			E.....						
	35C5.....					E.....						
	50C5.....		B.....									
	50C6G.....		B.....			E.....		K.....				
	35L6GT.....					E.....						
	50L6GT.....		B.....			E.....						
	70L7GT.....		B.....			E.....					9	
For 300 ma. types see type 25L6GT and for procedure see article on page 8.												
35L6GT.....	12A6.....		B.....						K.....		2	
	14A5.....		B.....			E.....			K.....		2	
	35A5.....					E.....					8	
	50A5.....		B.....			E.....						
	35B5.....					E.....						
	50B5.....		B.....			E.....						
	35C5.....					E.....						
	50C5.....		B.....			E.....						
	50C6G.....		B.....									
	50L6GT.....		B.....									
	70L7GT.....		B.....	D.....							9	
For 300 ma. types see type 25L6GT and for procedure see article on page 8.												

For details of changes indicated Refer to page 18		NO CHANGES FL. VOLTS FL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION REMOVE TOP CAP OR CHANGE TO 10-15 CHANGE BITS NOTE NO.										
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K		
35Y4	70L7GT.		B			E					9-10	
	35W4					E						
	50X6		B		D						10	
	50Y6GT		B			E					10	
	35Z3				D						10	
	35Z4GT					E					10	
	35Z5GT					E						
	40Z5		B			E					10	
	45Z3		B	C		E					10	
	45Z5GT		B			E						
	50Z7G		B			E						
35Z3	70L7GT.		B			E					9	
	35W4					E						
	35Y4				D							
	50Y6GT		B			E						
	35Z4GT					E						
	35Z5GT					E						
	40Z5		B			E						
	45Z3		B	C		E						
	45Z5GT		B			E						
	50Z7GT		B			E						
35Z4GT	70L7GT.		B		D						9	
	35W4					E						
	35Y4					E						
	50Y6GT		B		D							
	35Z3					E						
	35Z5GT				D							
	40Z5		B			E						
	45Z3		B	C		E						
	45Z5GT		B		D							
	50Z7GT		B		D							
35Z5GT	70L7GT.		B								9-10	
	35Y4					E						
	50Y6GT		B		D						10	
	35Z3					E					8-10	
	35Z4GT										10	
	40Z5		B									
	45Z3		B	C		E					10	
	45Z5GT		B									
	50Z7GT		B		D							
45Z5GT	70L7GT.		B		D						10	
	35Y4		B			E						
	50Y6GT		B		D						10	
	35Z3		B			E					10	
	35Z4GT		B		D						10	
	35Z5GT		B									
	40Z5		A									
	45Z3			C		E					10	
	50Z7GT		B		D						10	
50A5	12A6		B			E				K		
	14A5		B							K		
	35A5		B									
	50B5				D							
	50C5				D							
	50C6G					E						
	35L6GT		B			E						
	50L6GT					E						
	70L7GT		B			E					10	
For 300 ma. types see type 25L6GT and for procedure see article on page 8.												
50B5	35B5		B									
	35C5		B		D							
	50C5				D							

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		NO CHANGES	FILE VOLTS	FILE CURRENT	REWIRE SOCKET	CHANGE SOCKET	REALIGN	CAP. CONNECTION	CHANGE TOP CAP	CHANGE BIAS VOLTAGE	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
50C6G.....	12A6.....	B								K	
	14A5.....	B			E					K	
	35A5.....	B			E					K	
	50A5.....				E					K	
	35L6GT.....	B								K	
	50L6GT.....									K	
	70L7GT.....	B		D						K	10
For 300 ma. types see type 25C6G and for procedure see article on page 8.											
50L6GT.....	12A6.....	B								K	2
	14A5.....	B			E					K	2
	35A5.....	B			E						
	50A5.....				E					8	
	35B5.....	B			E						
	50B5.....				E						
	35C5.....	B			E						
	50C5.....				E						
	50C6G.....									K	
	35L6GT.....	B									
	70L7GT.....	B		D							
For 300 ma. types see type 25L6GT and for procedure see article on page 8.											
50X6.....	50Y6GT.....					E					
	50Y7GT.....					E					
	50Z7G.....					E					
	117Z6GT.....	B	C			E					
See also types under 50Y6GT for use as a half wave rectifier.											

For details of changes indicated Refer to page 18		NO CHANGES	FILE VOLTS	FILE CURRENT	REWIRE SOCKET	CHANGE SOCKET	REALIGN	CAP. CONNECTION	CHANGE TOP CAP	CHANGE BIAS VOLTAGE	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
50Y6GT.....	117Z6GT.....	B	C								12
	50X6.....					E					10
	50Z7G.....				D						12
	70L7G.....				D						4
For 300 ma. types see type 25Z6 and for procedure see article on page 8.											
When used as a half-wave rectifier the following will substitute, if load is not too great.											
	35Z3.....	B			E						12
	35Z4GT.....	B		D							12
	35Z5GT.....	B		D							12
	45Z5GT.....				D						12
	35Y4.....	B			E						12
	70L7GT.....	B		D							9
	117Z4GT.....	B	C	D							12
50Z7G.....	50Y6GT.....				D						10
	70L7GT.....	B		D							4-10
	117Z6GT.....	B	C	D							10
See also type 50Y6GT above.											
70L7GT.....	70A7GT.....				D						
	117P7GT.....	B	C	D							K 2
	117N7GT.....	B	C	D							2
	117L7/M7GT.....	B	C	D							2
XXD.....	14AF7.....	A									
	14F7.....									K	
	12SL7GT.....					E				K	
	12AH7GT.....					E					
	12SC7.....					E				K	

## NOTES FOR 150 MA., 300 MA., TRANSFORMER AND AUTO TYPES

- This is shown only when the tubes are directly interchangeable for all published ratings. Unusual operating conditions may require analysis.
- This means that the heater voltage on the substitute tube is different from the required type. In most cases this can be taken care of by changing or shorting out a section of the series resistor. In cases where the resistor is in the line cord this is difficult unless the total voltage can be increased enough to make a line resistor unnecessary. In transformer and auto sets this indicates that a series resistor is required to drop the voltage to that required by the substitute tube.
- Indicates that the heater current of the substitute tube is different from the desired tube and that parallel resistors must be used as explained in the article on Page 8. In transformer and auto sets tubes requiring more current should be used cautiously to avoid overloading the filament circuit. When more than one substitution is required in the same set it is sometimes possible for one to require a lower current keeping the total the same.
- In these cases the tube socket is the same but some rearrangement of the connections may be necessary. It may only be necessary to be sure that contacts connected to elements of the substitute tube which are not required in that circuit are not used as tie points.
- Requires a different type of socket. Watch out for tie points as in "D".
- Realignment is recommended as good practice in all cases of RF and IF tube changes.
- Provision must be made for connection to the top cap of the substitute tube which was not originally required.
- The former top-cap connection will have to be changed to connect to a base pin.
- Indicates that the substitute tube operates at a different bias for the applied plate voltage than the original tubes. Self bias circuits give some automatic correction but this should be measured and changed if necessary to prevent early failures.
  - The use of a sharp cut-off pentode in place of a remote cutoff tube may cause great distortion in locations when strong signals are available. If no other substitute can be found all tubes on the A.V.C. system should be changed.
  - The optimum load resistance for these types is more than 20% off. If tone or volume is noticeably poor, transformer tap adjustment or a new transformer may be required.
  - Requires addition of screen voltage, resistor and bypass condenser. Select resistor to give screen volts approximately equal to actual plate volts.
  - This type can be used as a triode by tying screen and suppressor to the plate. As a rectifier tie all grids to plate.
  - A type 1N34 crystal may be used in place of the diode section of the original tube.
  - If voltage at screen is greater than rated value it should be reduced.
  - Screen voltage may be increased for this type.
  - Circuit for this substitution is given on last few pages of this booklet.
  - Unused elements should be connected to chassis or cathode terminal.
  - Pilot lamp may be omitted or provided for by other means.
  - This converter substitution is tricky. Some experimentation may be required to find the best connection for each set. Adaptor circuits in the back of this book may help.
  - Check load current to be sure it is within ratings of substitute tube.

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# 300 MA. SERIES HEATER TYPES

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. TOLERANCE OR PLATE CONNECTION CHANGE BASE OR PLATE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
1V.....	12Z3.....	B									
	76.....					E				4	
	37.....					E				4	
	6J5GT.....					E				4	
	12A7.....	B				E				9	
	14Y4.....	B				E					
Any type listed under 35Z3 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6A7.....	6A8GT.....					E	F			8	
	6AN7.....	C				E					
	6J8G.....					E	F			8	
	6K8GT.....					E	F			8	
	7B8.....					E	F				
	7J7.....					E	F				
	7S7.....					E	F				
Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6A8G.....	6J8G.....					F					
	6K8GT.....					F					
	6A7.....					E	F			8	
	7B8.....					E	F			8	
	7J7.....					E	F			8	
	7S7.....					E	F				
	12B8GT.....	B	D			F				8	
Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6AE5GT/G.....	6C5GT.....									K	
	6AF5G.....									K	
	6J5GT.....									K	
	6P5GT.....									K	
	7A4.....					E				K	
Any type listed under 6L5G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) See also type 25AC5GT.											
6AF5G.....	6J5G.....									K	
	6C5GT.....									K	
	6P5GT.....									K	
	7A4.....					E				K	
	6AE5GT.....									K	
	76.....					E				K	
6B7.....	6B8G.....					E					
	6SF7.....					E				K	
	7E7.....					E					
	7R7.....					E				K	
Any type listed under 12C8 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6B8G.....	6B7.....					E					
	6SF7.....		D							K	
	7E7.....					E					
	7R7.....					E				K	
Any type listed under 12C8 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6BE6.....	6A8GT.....					E	F	G		11	
	7Q7.....					E	F				
	6SA7GT.....					E	F				
	6AN7.....					E	F			11	
	6D8G.....	C				E	F	G		11	
	6J8G.....					E	F	G		11	
	6K8GT.....					E	F	G		11	
	7A8.....					E	F			11	
	7B8.....					E	F			11	

For details of changes indicated Refer to page 18		<div>NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR PLATE TOP VOLTS CHANGE BASE VOLTS NOTE NO.</div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6BE6.....	7J7.....					E	F				11
(Continued)	6BA7.....					E	F				
	12BE6.....	B	C			F					
	12SY7.....	B	C			E	F				
6C5GT.....	7A4.....					E					8
	6J5GT.....	A									
	6AF5G.....									K	
	76.....					E				K	
	6P5GT.....									K	
	37.....					E				K	
	6AE5G.....									K	
	6V7G.....				D					K	
	85.....					E				K	
	6R7G.....				D		G				
	6SR7G.....				D						
Any type listed under 6L5G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6C6.....	77.....					F					
	6J7GT.....					E	F				
	6SH7GT.....					E	F	H			6
	6SJ7GT.....					E	F	H			
	7L7.....					E	F	H			6
	7H7.....					E	F	H			6
	7G7.....					E	F	H			6
	36.....					E	F				
	6D7.....					E	F				
Also types under 6D6, but see Note 1. Any types listed under 6W7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6D6.....	78.....					F					
	39/44.....					E	F				
	6K7GT.....					E	F				
	6SK7GT.....					E	F	H			
	6U7G.....					E	F				
	6SD7GT.....					E	F	H			6
	6SG7.....					E	F	H			6
	7A7.....					E	F	H			
	6E7.....					E	F				
Also types under 6C6, but see note 1. Any types listed under 6S7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6F5GT.....	6K5GT.....				D						
	6SF5GT.....				E			H			
	6SL7GT.....				D						9
	6Q7GT.....				D						9
	6SQ7GT.....				D			H			9
	75.....				E						9
	6B6G.....				D						9
	6B8G.....				D						3
	6SF7.....				D			H			3
	6F7.....				E						3-9
	6P7G.....				D						3-9
	6B7.....				E						3
	7B4.....				E						8
	7B6.....				E						8-9
Any type listed under 12F5G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)											
6F7.....	6F7S.....					F					
	6P7G.....					E	F				
	12B8GT.....	B				E	F			K	
	25B8GT.....	B	C			E	F			K	
6H6GT.....	6C8G.....				D			G			4
	12A7.....	B			D			G			4

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR PLATE TOP CONNECTION CHANGE BIAS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6H6GT.....	7F7.....					E					4
(Continued)	14N7.....	B				E					4
	14Y4.....	B				E					
	Any type listed under 7A6 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6J5GT.....	6C5GT.....	A									
	See also 6C5GT in this table.										
6J7GT.....	7L7.....					E	F		H		6-8
	6SJ7GT.....				D		F		H		
	77.....					E	F				
	6C6.....					E	F				
	6SH7GT.....				D		F		H		6
	7H7.....					E	F		H		6
	Any type listed under 6W7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6J8G.....	6A8GT.....					F					
	6K8GT.....					F					
	6A7.....					E	F				
	7B8.....					E	F		H		8
	7J7.....					E	F		H		8
	7S7.....					E	F		H		8
	6F7.....					E	F				
	6P7G.....				D		F				
	Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6K5GT.....	See 6F5GT.....										
6K7GT.....	7H7.....					E	F		H		6-8
	6U7G.....					F					
	6SK7GT.....				D		F		H		
	39/44.....					E	F				
	78.....					E	F				
	6D6.....					E	F				
	36.....					E	F				
	6SG7.....				D		F		H		6
	7A7.....					E	F		H		8
	Types under 6J7GT, but see note 1.										
	Any type listed under 6S7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6K8GT.....	6J8G.....					F					
	6A8GT.....					F					
	6A7.....					E	F				
	7B8.....					E	F				
	7J7.....					E	F				
	7S7.....					E	F				
	Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6P5GT.....	See 6C5GT—Bias change may not be required.										
6P7G.....	6F7.....					E	F				
	12B8GT.....	B			D		F			K	
	25B8GT.....	B	C	D			F			K	
6Q7GT.....	6B6G.....	A									
	6SQ7GT.....				D				H		
	75.....					E				8	
	7B6.....					E			H		8
	7K7.....					E			H		
	XXFM.....					E			H		
	6B7.....					E				3	
	6B8G.....				D					3	
	6SF7.....				D				H		3

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR PLATE TOP CONNECTION CHANGE BIAS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6Q7GT.....	7E7.....					E			H		3
(Continued)	7R7.....					E			H		3
	Any type listed under 6T7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6R7GT.....	6V7G.....									K	
	85.....					E				K	
	6SR7GT.....				D				H		
	6B7.....					E				K	4
	6B8G.....				D					K	4
	6SF7.....				D				H	K	4
	7E7.....					E			H	K	4
	7R7.....					E			H	K	4
	7E6.....					E			H	K	4
6SA7GT.....	6A8GT.....				D			G			11
	6J8G.....				D			G			11
	6K8GT.....				D			G			11
	7B8.....					E					11
	7Q7.....					E					8
	7J7.....					E					11
	7S7.....					E					11
	Any type listed under 12SA7GT in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6SJ7GT.....	7L7.....					E	F				6
	6J7GT.....				D		F	G			
	77.....					E	F	G			
	6C6.....					E	F	G			
	6SH7GT.....				D		F				6
	7H7.....					E	F				6
	7C7.....				C		E	F			
	7A7.....				C		E	F			
	6AG5.....					E	F				6
	6W7G.....				C	D		F	G		
	7AJ7.....					E	F				
6SK7GT.....	6BJ6.....					E	F				
	6K7GT.....				D		F	G			
	78.....					E	F	G			
	6D6.....					E	F	G			
	7B7.....				C		E	F			
	6U7G.....				D		F	G			
	7A7.....					E	F				
	6SG7GT.....				D		F				6
	6S7G.....				C	D		F	G		
	6SS7.....				C		F				
	6BJ6.....				C		E	F			
6SQ7GT.....	7B6.....					E					
	7K7.....					E					
	7X7 (XXFM).....					E					
	75.....					E		G			
	6AT6.....					E					
	6AV6.....					E					
	6AW7GT.....				D						
	6B6G.....					E		G			
	6BD7.....				C		E				
	6BK6.....					E					
	6BT6.....					E					
	6Q7GT.....				D			G			
	6S8GT.....				D						
	6T7G.....				C	D		G			
	6T8.....				C		E				
	7C6.....				C		E				
	6SZ7.....				C						
	Also any triode like 6F5G plus one or two 1N34 crystals in place of the diodes.										
6U7G.....	6K7GT.....					F			H	K	
	6SK7GT.....				D		F		H	K	
	6SD7.....				D		F		H		6

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# 300 MA. SERIES HEATER TYPES

For details of changes indicated Refer to page 18										
REQUIRED TYPE	POSSIBLE REPLACEMENTS	NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR PLATE TOP CAP. CONNECTION CHANGE BIAS VOLTS NOTE NO.								
		A	B	C	D	E	F	G	H	K
6U7G.....	39/44.....					E	F			
(Continued)	78.....					E	F		K	
	6D6.....					E	F			
	7A7.....					E	F	H		
	6B7.....					E	F			9
	6B8G.....			D		F				9
	6SF7.....			D		F	H	K		9
	6F7.....					E	F			9
	6P7G.....			D		F				9
	12B8GT.....	B		D		F				9
	36.....					E	F			
Any type listed under 6S7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
6V7G.....	85.....					E				
See type 6R7G, Bias change may not be required										
12A5.....	25B6G.....	B				E				2
	38.....	B				E	G	K		2
	25A6.....	B				E				
	43.....	B				E				
	14C5.....	C				E				K
	25A7G.....	B				E				
	25L6GT.....	B				E				K 2
	25C6G.....	B				E				K 2
	25N6G.....	B				E				K 2
	32L7GT.....	B				E				K 2
	12A7.....		D			G				K 2
Any type listed under 6G6G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.)										
12A7.....	32L7GT.....	B				E		H	K	2
	25A7GT.....	B				E		H	K	2
Any type listed under 70L7GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
12B8GT.....	12AT6 and	Make adaptor F... H... 9								
	12BA6	with 2 min. sockets								
	12AV6 and	Make adaptor F... H... 9								
	12BD6	with 2 mln. sockets								
	12BK6 and	Make adaptor F... H... 9								
	12BA6	with 2 min. sockets								
	12BT6 and	Make adaptor F... H... 9								
	12BD6	with 2 min. sockets								
	6F7.....	B								K
	6P7G.....	B								K
	25B8GT.....	B	C							
12Z3.....	1V.....	B								
	12A7.....					E	G			4
	76.....	B				E				4
	37.....	B				E				4
	6J5G.....	B				E				4
	14Y4.....					E				
	28Z5.....	B	C			E				
Any type listed under 35Z3 in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
25A6GT.....	14C5.....	B	C			E				8
	25B6G.....									2
	25N6G.....									K 2
	25L6GT.....									K 2
	43.....					E				
	12A5.....	B				E				
	38.....	B				E	G	K		2-8
	25C6G.....	B				E				K 2
	32L7GT.....	B	D							9
	25A7GT.....		D							K 2-9
	12A7.....	B				E	G	K		2-9
	25B5.....					E				K
Any type listed under 35L6GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
25Y5.....	25Z5.....	A								
	25Z6GT.....					E				
	50Y6GT.....	B	C			E				
	50Z7G.....	B	C			E				
When used as a half-wave rectifier, add types under 12Z3.										
25Z5.....	Same as 25Y5 above.									
25Z6GT.....	25Z5.....					E				8
	25Y5.....					E				
	50Y6GT.....	B	C							
	50Z7G.....	B	C	D						
When used as a half-wave rectifier add types under 12Z3.										

For details of changes indicated Refer to page 18										
REQUIRED TYPE	POSSIBLE REPLACEMENTS	NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR PLATE TOP CAP. CONNECTION CHANGE BIAS VOLTS NOTE NO.								
		A	B	C	D	E	F	G	H	K
25A6GT.....	Any type listed under 35A5 in 150 ma. chart (Continued) may be used with simple resistor changed. (See article on page 8.)									
25A7GT.....	12A7.....		B			E		G		K 2
	32L7GT.....		B							K 2
Any type listed under 70L7GT on 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
25AC5GT.....	Same types as 25A6GT. (Driver no longer required.)									
25B6G.....	25N6G.....									K
	25L6GT.....									K
	25C6G.....									K
	12A5.....		B			E				2
	38.....		B			E	G	K		2
	25A6GT.....									2
	25A7GT.....		D							2-9
	12A7.....		B			E	G	K		2-9
	25B5.....					E				K
	43.....					E				2
	32L7GT.....		B	D						K 2-9
Any type listed under 35A5 in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
25C6G.....	25N6G.....									K 2
	25L6GT.....									K 2
	25A6GT.....									K 2
	43.....					E				K 2
	12A5.....		B			E				K 2
	38.....		B			E	G	K		2
	25B6G.....									K 2
	32L7GT.....		B	D						K 2-9
	25A7GT.....		D							K 2-9
	12A7.....		B			E	G	K		2-9
	25B5.....					E				K 2
Any type listed under 35L6GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
25L6GT.....	14C5.....		B	C		E				8
	25N6G.....									K
	25A6GT.....									K 2
	25B6G.....									K
	25C6G.....									K 2
	43.....					E				K 2-8
	12A5.....		B			E				K 2
	38.....		B			E	G	K		2
	32L7GT.....		B	D						9
	25A7GT.....		D							K 2-9
	12A7.....		B			E	G	K		2-9
	25B5.....					E				K
Any type listed under 35L6GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)										
25Y5.....	25Z5.....	A								
	25Z6GT.....					E				
	50Y6GT.....	B	C			E				
	50Z7G.....	B	C			E				
When used as a half-wave rectifier, add types under 12Z3.										
25Z5.....	Same as 25Y5 above.									
25Z6GT.....	25Z5.....					E				8
	25Y5.....					E				
	50Y6GT.....	B	C							
	50Z7G.....	B	C	D						
When used as a half-wave rectifier add types under 12Z3.										

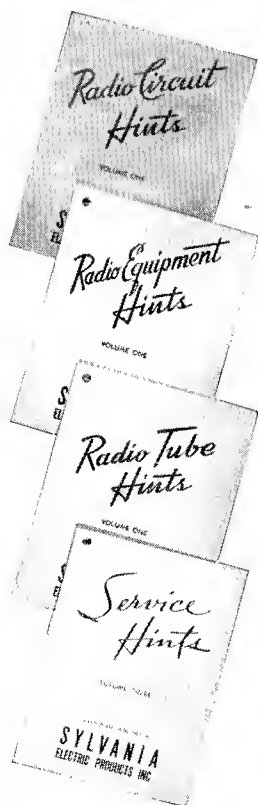
These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION REWIRE TOP OR PLATE TOP CAP. CONNECTION CHANGE BVS OR PLATE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
32L7GT.....	25A7GT.....	B								K	2
	12A7.....	B				E		G		K	2
	70L7GT.....	B	C	D						K	
36.....	6C6.....					E	F				6
	77.....					E	F				6
	6J7GT.....					E	F				6
	6SH7GT.....					E	F		H		6
	6SJ7GT.....					E	F		H		6
	7L7.....					E	F		H		6
	7H7.....					E	F		H		6
	7G7.....					E	F		H		6
Also types under 6D6, but see note 1. Any type listed under 6W7G in 150 ma. chart may be used with simple resistor changes. (See article on page 8.)											
37.....	76.....	A									
Also types shown under 6C5GT, add note E.											
38.....	12A7.....					E					9
Also types shown under type 12A5.											

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION REWIRE TOP OR PLATE TOP CAP. CONNECTION CHANGE BVS OR PLATE VOLTS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
39/44.....	78.....					E	F				
	6D6.....					E	F				
See also type 6D6.											
43.....	25A6GT.....					E					
See also type 25A6GT and add note E.											
75.....	6Q7G.....					E					8
See also type 6Q7G and add note E.											
76.....	37.....	A									
Also types shown under 6C5GT and add note E.											
77.....	6C6.....					F					
Also types under 6C6.											
78.....	6D6.....					F					
Also types under 6D6.											
85.....	6R7GT.....					E				K	
Also types under 6R7GT and add note E.											

## SYLVANIA REFERENCE BOOKS



**227**  
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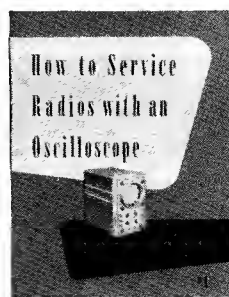
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These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

# TRANSFORMER AND AUTO TYPES

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION 200 TO 250V OR CHANGE B1'S OR CHANGE B2'S NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
OZ4 (G).....	84.....		B			E					
	6X5.....		B		D						
		(Sometimes already wired)									
	7Y4.....		B			E					
2A3.....	2A5.....					E				K	
	59.....					E				K	
	47.....					E				K	
	46.....					E				K	
2A5.....	47.....					E				K	
	59.....					E				K	
2A6.....	2B7.....					E				3	
5U4G.....	5X4G.....				D						
	83.....					E					
	83V.....					E					
	5V4G.....				D						
5V4G.....	83V (See also type 82)					E					
5W4G.....	5Y3G.....	A									
	80.....					E					
	5Y4G.....				D						
	5Z4.....				D						
5X4G.....	5U4G.....				D						
	83.....					E					
	83V.....					E					
	5Z3.....					E					
5Y3G.....	5AZ4.....					E					
	5V4G.....				D						
	5W4G.....	A									
	5Z4.....				D						
	80.....					E					
	83V.....					E					
	5Y4G.....				D						
5Y4G.....	Same as 5Y3G above. (Add note D.)										
5Z3.....	5U4G.....					E					
	5X4G.....					E					
	83.....	A									
	83V.....	A									
5Z4.....	5V4G.....	A									
	5W4G.....				D						
	5Y3G.....	A									
	5Y4G.....				D						
	80.....					E					
	83V.....					E					
6A3.....	6A5G.....					E					
	6B4G.....					E					
6A5G.....	6B4G.....				D						
	6A3.....					E					
6A6.....	79.....					E			K	2	
	6N7G.....					E					
	6Y7G.....					E			K	2	
	6Z7G.....					E			K	2	
6B4G.....	6A3.....					E					
	6A5G.....				D						

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION 200 TO 250V OR REMOVE TOP CAP OR CHANGE B1'S OR CHANGE B2'S NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6B5.....	6N6G.....					E					
	42.....									K	
	6F6.....					E				K	
	41.....									K	
	7B5.....					E				K	
	7C5.....					E				K	
6F6G.....	42.....					E				8	
	41.....					E				K 8	
	7C5.....					E				K 2	
	7B5.....					E				K	
	6B5.....					E				K	
6F8G.....	6C8G.....									K	
	6N7G.....				D					K	
	6SN7GT.....				D						
	7N7.....					E					
6K6GT.....	6V6GT.....			C						K	
	6F6G.....			C						K	
	6U6GT.....			C						K	
	7A5.....			C		E				K	
	7B5.....					E					
	7C5.....			C		E				K	
	42.....			C		E				K 8	
	41.....					E				8	
	6B5.....			C		E				K	
6L6G.....	6L6GA.....	A									
	6AH5G.....				D						
	6F6G.....			C						K 2	
	42.....			C		E				K 2	
6N6G.....	6B5.....					E					
	42.....					E				K	
	6F6.....									K	
	41.....					E				K	
	7B5.....					E				K	
	7C5.....					E				K 2	
6N7G.....	6Y7G.....									2	
	6Z7G.....									2	
	6A6.....					E				2	
	79.....					E		G			
6U5/6G5.....	6E5.....	A									
	6AB5/6N5.....			C							
	2E5.....			B	C						
	6T5.....	A									
	6H5.....	A									
6U6GT.....	See type 6K6GT										
6V6GT.....	See type 6K6GT										
6X5GT.....	6ZY5G.....			C						2	
	84.....					E				8	
	6Z5.....				D						
	7Y4.....					E				8	
	6Y5.....			C		E					
7B5.....	6V6GT.....			C		E				K 2	
	6K6GT.....					E					
	6F6G.....					E				K	
	6U6GT.....			C		E				K 2	
	7C5.....			C						K 2	
	6B5.....			C		E				K	
	41.....					E					
	42.....					E					

See also 150 Ma. and 300 Ma. tables. Any type which does not require a voltage change may be used. Some types commonly used in television receivers are listed in the table starting on Page 26.



# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18											
REQUIRED TYPE	POSSIBLE REPLACEMENTS	<div>NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR REMOVE TOP CAP REMOVE TOP CONNECTION CHANGE BITS NOTE NO.</div>									
		A	B	C	D	E	F	G	H	K	
7C5	6V6GT					E					
	6K6GT			C		E			K	2	
	6F6G			C		E			K	2	
	6U6GT			C		E			K	2	
	7B5			C		E			K	2	
	41			C		E			K	2	
	42			C		E			K	2	
7N7	6N7G			C		E			K		
	6F8G					E					
	6C8G			C		E		G	K		
	6SN7GT					E					
12A	01A								K		
24A	57				C		E	F			
	35							F			
26	27		B	C		E	F				
	56		B	C		E	F				
35/51	24						F			1	
	58			C			F				
	57			C			F			1	
41	42			C					K		
	6K6G			C		E					
	6F6G					E					
	6U6GT			C		E			K	2	
	6B5			C					K		
	6N6G			C		E			K		
	7A5			C		E			K	2	
	7B5					E				8	
	7C5			C		E			K		
	6V6GT			C		E			K		
42	41			C					K		
	6K6G			C		E			K		
	6F6G			C		E					
	6U6GT			C		E			K	2	
	6B5			C					K		
	6N6G			C		E			K		
	7A5			C		E			K	2	
	7B5			C		E			K	8	
	7C5			C		E			K	2	
	6V6GT			C		E			K	2	
45	2A3			C					K		
	46			C		E			K		
	47			C		E			K		
	59			C		E			K		
46	47								K		
	59			C		E			K		
56	27			C					K		
57	58								K		
	24A			C		E					
	35/51			C		E					
58	Same as 57. See note (1).										
59	46			C		E			K		
	47When used as pen.			C		E			K		
	45When used as tri.			C		E			K		
71A	182B			C					K		
	183			C					K		
	12A								K		

For details of changes indicated Refer to page 18											
REQUIRED TYPE	POSSIBLE REPLACEMENTS	NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR REMOVE TOP CAP REMOVE TOP CONNECTION CHANGE BITS NOTE NO.									
		A	B	C	D	E	F	G	H	K	
80.....	5Y4G.....					E.....					
	5Y3GT.....					E.....					
	5W4GT.....			C.....		E.....					
	5Z4.....					E.....					
	5V4G.....					E.....					
	83.....			C.....						2	
	83V.....									2	
	5Z3.....			C.....						2	
	5X4G.....			C.....		E.....				2	
	5U4G.....			C.....		E.....				2	
83.....	83V.....		A.....								
	5Z3.....		A.....								
	5X4G.....					E.....					
	5U4G.....					E.....					
84.....	6X5.....			C.....		E.....					
	6Y5.....			C.....							
	6Z5.....			C.....		E.....					
	6ZY5G.....			C.....		E.....					
	7Y4.....					E.....				8	
89.....	89Y.....		A.....								
	41.....				D.....					K.....	
	6K6G.....					E.....				K.....	
117L7/M7GT.....	117N7GT.....				D.....					K.....	
	117P7GT.....				D.....						
	70L7GT.....		B.....	C.....	D.....					K..... 2	
	70A7GT.....		B.....	C.....	D.....					2	
117N7GT.....	117L7/M7GT.....				D.....					K..... 2	
	117P7GT.....									K.....	
	70L7GT.....		B.....	C.....	D.....					K..... 2	
	70A7GT.....		B.....	C.....	D.....					K..... 2	
117P7GT.....	117L7/M7GT.....				D.....						
	117N7GT.....									K.....	
	70L7GT.....		B.....	C.....	D.....					K..... 2	
	70A7GT.....		B.....	C.....	D.....					K..... 2	
117Z6GT.....	117L7/M7GT.....			C.....	D.....					4	
	117N7GT.....			C.....	D.....					4	
	70L7GT.....		B.....	C.....	D.....					4	
	117P7GT.....			C.....	D.....					4	
	70A7GT.....		B.....	C.....	D.....					4	
	50Y6GT.....		B.....	C.....							
	50Z7G.....		B.....	C.....	D.....						
When used as a half-wave rectifier, additional types may be found under 50Y6GT.											
182B/482B.....	183/483.....									K.....	
	71A.....			C.....						K.....	
	45.....		B.....		D.....					K.....	
	46.....		B.....			E.....				K.....	
	2A3.....		B.....							K.....	
183/483.....	182B/482B.....									K.....	
	12A.....			C.....						K.....	
	45.....		B.....		D (Series Fil.)					K.....	
	46.....		B.....		E " "					K.....	
	2A3.....		B.....		D (Series Fil.)					K.....	
485.....	27.....		B.....							K.....	
	56.....		B.....							K.....	

See also 150 Ma. and 300 Ma. tables. Any type which does not require a voltage change may be used. Some types commonly used in television receivers are listed in the table starting on page 26.

# TUBE SUBSTITUTIONS IN TELEVISION RECEIVERS

Many television receiver circuits demand tube performances beyond those required by standard broadcast receivers. New functions, higher frequencies and often higher voltages result in a very limited number of tube types suitable for most television receiver sockets. As a result, only the simplest of the substitutions listed are suggested for satisfactory performance. Even so, each receiver model should be considered individually with particular reference to the manufacturer's instruction manuals and servicing data. The following general comments on various functions may also be of aid in selecting a substitute type.

**RF—CONVERTER—IF STAGES:** The use of one higher or lower Gm tube in the RF or IF stages will not be likely to give trouble. If it causes oscillation which cannot be removed by alignment, the screen voltage may be lowered slightly. The effect of one low mutual conductance tube in the IF section probably would be negligible, but more than one would be almost certain to give noticeably poor results. Tubes with the same base, and if possible the same basing, should be selected, as any disturbance to the original wiring might make it difficult, if not impossible, to realign the stage properly. Where the substitute tube has a different value of screen current a change in the series screen resistor may be required.

**DETECTORS:** When diodes are used, very little trouble need be expected with any reasonable substitution. There are, however, receivers using duo-triodes with the other section of the tube possibly in a more critical circuit.

**SYNC STRIPPERS AND SEPARATORS:** These circuits depend on the correct matching of the tube characteristics if the applied signal is to give the exact magnitude and wave-shape required for the output. Changes in load resistors, bleeders, or input signal may be required for satisfactory operation of a substitute. An oscilloscope should be used to check for the proper wave form.

**HORIZONTAL OSCILLATOR:** In general, this is a very difficult circuit to readjust for a substitute tube. Since this tube is used in the AFC circuit any change in current or bias could completely upset the tuning adjustments.

**HORIZONTAL OUTPUT:** Since many of the suggested substitutions require the use of two tubes in parallel, trouble may be encountered due to parasitic oscillations. The addition of a 100-ohm resistor in each grid lead, a 50-ohm resistor in each screen lead, and the use of separate cathode resistors, each twice the value required for the original single tube, is generally effective in eliminating this difficulty. A 50-ohm resistor in each plate lead, close to the socket, may be required in a few cases.

**VERTICAL OUTPUT:** The usual difficulty with substitutions in this stage is obtaining linearity. This is largely due to a mismatch between tube and load. If the adjustment does not give a good picture, little can be done other than try another substitute.

**DAMPER DIODES:** These are critical in two ratings seldom considered seriously in the broadcast receiver. They are the peak inverse voltage rating, and, in some circuits, the maximum permissible heater-cathode voltage. Differences in the heater-cathode voltage rating can be taken care of by using an isolation transformer in the heater circuit, but the peak inverse rating can only be increased by adding tubes in series which is not practical. Damper tubes also require a high current rating making it difficult to find a suitable substitute.

**HIGH VOLTAGE RECTIFIERS:** There are at least three circuits commonly used in high voltage sections: (1) RF Oscillator, (2) Fly-back transformer, (3) Fly-back transformer with voltage-doubler. The peak inverse voltage requirements of the RF and fly-back type circuits are quite different from one another. Although it is possible to change from one system to another, a great deal of careful study of this circuit on the part of the serviceman is urged before such an alteration is attempted.

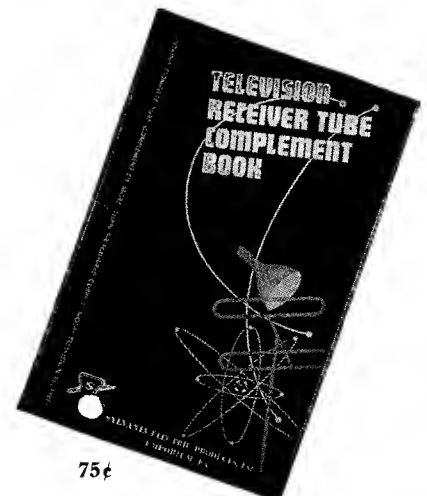


## 205 Television Servicing Book-Vol.II

The biggest "little" book ever printed for the television serviceman. Contains page after page of handy reference for the causes and corrections for faulty reception in TV receiving sets. Profusely illustrated, complete with circuit diagrams, that save guessing and suggestions that save time and make more money, quicker, for you! Handy pocket size, 5" x 7".

## 204 Television Tube Complement Book

The most complete, authentic book of its type ever published. Gives complete tube complement of all current television receiver models. Includes list of manufacturer's names and addresses, replacement charts and usage table. It's an absolute "must" on your shelf for successful servicing of any television receiver, one of the many Sylvania services designed to help you give more dependable service.



**-SYLVANIA SUBSTITUTION MANUAL.**

For details of changes indicated Refer to page 28		NO CHANGES	FL. VOLTS	FL. CURRENT	CHANGE SOCKET	ALIGN	CHANGE SOCKET	ADD CONNECTION	REMOVE CONNECTION	CHANGE BASE	CHANGE VOLTS	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K		
1B3GT	1X2 (A)					E						13
	1Y2		B	C		E						
	5642					E						13
1V2	1B3GT		B	C		E		G				
	1X2 (A)		B	C	D			G				
	5642		B	C		E		G				
	1Y2		B	C		E		G				
1X2 (A)	1V2		B	C	D				H			13
	5642		B	C		E		G				13
	1B3GT					E						
6AG5	6AK5			C			F			K		
	6BC5						F					
	6BH6			C			F					
	6AU6				D		F					
	6CB6				D		F					
	6AS6			C	D		F					
	12AU6		B	C	D		F					
	12AW6		B	C	D							
	5591			C			F			K		
	5654			C			F					
6AK5	6AG5			C			F			K		
	6BC5			C			F			K		
	6BH6			C			F			K		
	6AU6			C			F			K		
	6CB6			C	D		F					
	6AS6						F					
	12AU6		B	C			F			K		
	12AW6		B	C	D		F			K		
	5591			C			F					
	5654						F					
6AL5	12AL5		B	C								
	5726		A									
	6AQ7GT					E						11
	6AW7GT					E						11
	6BC7			C		E						
	6H6GT					E						
	7A6			C		E						
	14A6		B			E						
	12AT7					E						11
	12AU7					E						11
	12AV7					E						11
	12AX7					E						11
	12AY7					E						11
	1N34											
	1N60											
6AQ5	6AR5			C	D					K		
(when used as a pentode or triode)	5686			C		E						
	6V6GT					E						
	7C5					E						
	6BF5			C								
	6K6GT			C		E				K		
6AQ5	6SN7GT			C		E				K		22
(when used as a triode only)	6BF5			C								4
	6W6GT					E						4
	6S4			C		E				K		
	12BH7			C		E				K		22
6AT6	6AQ6			C								
	6AQ7GT					E						
	6AV6											
	6AW7GT					E						
	6B6G					E		G				
	6BD7			C		E						
	6BK6		A									
	6BT6		A									

For details of changes indicated Refer to Page 28		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAPACITOR CONNECTION OR SOCKET TOP CONNECTION CHANGE SOCKET TOP CHANGE BIAS VOLT NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6AU5GT.....	6AV5GT.....			C							
	6BG6G.....			C	D			G			
	6BQ6GT.....			C	D			G			
	6L6G (A).....			C	D						23
	807 (W).....			C		E		G			
	6AL6G.....			C	D			G			
	6AH5G.....			C	D						
6AU6.....	Same as type 6AK5										
6AV5GT.....	6AU5GT.....			C							
	6BG6G.....			C	D			G			
	6BQ6GT.....				D			G			
	6L6G (A).....			C	D						23
	6AL6G.....			C	D			G			
	807 (W).....			C		E		G			
	6AH5G.....			C	D						
6BC5.....	6AG5.....						F				
	6AK5.....			C			F			K	
	6AU6.....				D		F				
	6BH6.....			C	D		F				
	6CB6.....				D		F				
	6SH7GT.....					E	F				15
	7AG7.....			C		E	F				15
	5634.....			C			F			K	
	5591.....			C			F			K	
6BD5GT.....	6AU5GT.....			C						K	6
	6AV5GT.....			C						K	6
	6BG6G.....				D			G		K	6
	6BQ6GT.....			C	D			G		K	6
	6L6G (A).....				D						
	807 (W).....					E		G		K	6
6BG6G.....	6CD6G.....			C			F				10
	6BQ6GT.....			C	D		F				10-14
	6AV5GT.....			C	D		F				
	6AU5GT.....			C	D		F				
	807 (W).....					E	F				
	19BG6G.....		B	C			F				
	25BQ6GT.....		B	C	D		F				14
6BQ6GT.....	6BG6G.....			C	D		F				7
	6CD6G.....			C	D		F				7
	6AU5GT.....				D		F		H		
	6AV5GT.....				D		F		H		
	807 (W).....					E	F				7
	19BG6G.....		B	C	D		F				7
	25BQ6GT.....		B	C			F				
6CB6.....	6AK5.....			C	D		F			K	
	6AG5.....				D		F				
	6BC5.....				D		F				
	6BH6.....			C			F				
	6AU6.....				D		F				
	6AS6.....			C			F			K	
	12AU6.....		B	C	D		F				
	12AW6.....		B	C			F				
	5591.....			C	D		F			K	
	5634.....			C	D		F			K	
6CD6.....	6AU5GT.....					E		G			12
	6BQ6GT.....			C		E		G			12
	807 (W).....			C		E		G			12
	19BG6G.....		B	C		E		G			12
	25BQ6GT.....		B	C		E		G			12
	6BG6G.....			C		E		G			12
	6AV5GT.....			C		E		G			12

**These substitutions apply particularly for television sets but may be used anywhere providing all changes, particularly B and C are considered.**

# TELEVISION TYPES

For details of changes indicated Refer to page 28											
REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		NO CHANGES	FL. VOLTS	FL. CURRENT	REWIRE SOCKET	CHANGE SOCKET	REALIGN	ADD CONNECTION	REMOVE CONNECTION	OR RANGE TOP VOLTS	CHANGE BIAS VOLTS
6J6.....	12AT7.....				C		E	F			
	12AU7.....				C		E	F			15
	12AV7.....						E	F			15
	12AY7.....						E	F			15
	19J6.....		B	C			F				
	5687.....						E	F		K	
	7F8 (W).....				C		E	F			15
6S4.....	6SN7GT.....						E	F			22
	6SN7WGT.....						E	F			22
	5692.....						E	F			22
	6BL7GT.....				C		E	F			22
	12BH7.....					D	F				22
	7N7.....						E	F			22
	6AQ5.....				C		E	F			4
	12SN7GT.....		B	C			E	F			22
	12SX7GT.....		B	C			E	F			22
	14N7.....		B	C			E	F			22
	5687.....				C	D		F			22
6SL7GT.....	2C52.....		B				F				
	6C8G.....					D	F	G		K	
	6SL7WGT.....						F				
	6SU7GTY.....						F				
	7F7.....						E	F			
	7F8.....						E	F		K	
	7F8W.....						E	F		K	
	12AT7.....						E	F		K	
	12AV7.....				C		E	F		K	
	12AX7.....						E	F			
	12AY7.....						E	F		K	
	12SL7GT.....		B	C			F				
	14F7.....		B	C			E	F		K	
	14F8.....		B	C			E	F		K	
	5691.....				C		F				
	5694.....				C	D		F		K	
6SN7GT.....	6SN7WGT.....		A								
	6BL7GT.....				C						
	5692.....		A								
	6AH7GT.....				C	D		F			
	6F8G.....						F	G			
	7AF7.....				C		E	F			
	7N7.....						E	F			
	12AH7GT.....		B	C	D		F				
	12AU7.....				C		E	F			
	12SN7GT.....		B	C			F				
	12SX7GT.....		B	C			F				
	14N7.....		B	C			E	F			
	5687.....				C		E	F		K	
6T8.....	6S8GT.....				C		E		G		
	7K7.....				C		E				5
	6AQ6.....				C		E				5
	6AT6.....				C		E				5
	6AV6.....				C		E				5
	6BD7.....				C	D					5
	6BK6.....				C		E				5
	6BT6.....				C		E				5
	7C6.....				C		E				5
	19T8.....		B	C							
6V6GT.....	7C5.....						E				
	6BF5.....				C						
	6K6GT.....				C						
	6AQ5.....						E				
	6W6GT.....				C						
	6U6GT.....				C						
	6F6GT.....				C						
	41.....				C		E				
	42.....				C		E				

For details of changes indicated Refer to page 28											
		NOTE NO.									
		OR RANGE BIAS OR RANGE B									

These substitutions apply particularly for television sets but may be used anywhere providing all changes, particularly B and C are considered.

# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 28		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR. CONNECTION CHANGE WBS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
12SN7GT.....	12AH7GT.....			C	D		F			K	
	12AU7.....			C		E	F				
	12AV7.....					E	F			K	
	12SX7GT.....						F				
	14N7.....					E	F				
	5687.....			C		E	F				
	5694.....		B	C	D		F			K	
	6SN7GT.....		B	C			F				
	5692.....		B	C			F				
	14AF7.....			C		E	F				
	6F8G.....		B	C		E	F				
	12BH7.....					E	F				
19BG6G.....	25BQ6GT.....		B		D		F			14	
	807 (W).....		B	C		E	F				
	6CD6G.....		B	C			F			10	

For details of changes indicated Refer to Page 28		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR. CONNECTION CHANGE WBS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
19BG6G.....	6BQ6GT.....		B	C	D		F				10-14
Continued)	6BG6G.....		B	C			F				
25BQ6GT.....	19BG6G.....		B		D		F				
	807 (W).....		B	C		E	F				
	6CD6G.....		B	C	D		F				
	6BQ6GT.....		B	C			F				
	6BG6G.....		B	C	D		F				
25W4GT.....	25Z6.....					E					19
	25Z5.....				D						19
	35Z3.....		B	C		E					19, 21
	35Y4.....		B	C		E					19, 21
	50AX6G.....		B		D						19
	50X6.....		B	C		E					19
	6W4GT.....		B	C							
	6U4GT.....		B	C							

## NOTES FOR USE WITH TELEVISION TUBE TABLE

- A. This is shown only when the tubes are directly interchangeable for all published ratings. Unusual operating conditions may require analysis.
- B. This means that the heater voltage of the substitute type is different from the required type. A slight decrease can be taken care of by adding a series resistor but other changes may require a complete change in the power circuits or the addition of an extra transformer to provide the required voltage.
- C. Indicates that the heater current of the substitute tube is different from the required type. On transformer operated sets this is not too important unless the total current, particularly when more than one substitution is made, causes the transformer rating to be exceeded.
- D. In these cases the tube socket is the same but some rearrangement of the connections may be necessary. It may only be necessary to be sure that contacts connected to elements of the substitute tube which are not required in that circuit are not used as tie points.
- E. Requires a different type of socket. Watch out for tie points as in "D".
- F. Realignment is recommended as good practice in all cases of RF and IF tube changes.
- G. Provision must be made for connection to the top cap of the substitute tube which was not originally required.
- H. The former top-cap connection will have to be changed to connect to a base pin.
- K. Indicates that the substitute tube operates at a different bias for the applied plate voltage than the original tubes. Self bias circuits give some automatic correction but this should be measured and changed if necessary to prevent early failures.
- (1) The use of a sharp cut-off pentode in place of a remote cut-off tube may cause great distortion in locations when strong signals are available. If no other substitute can be found all tubes on the A.V.C. system should be changed.
- (2) The optimum load resistance for these types is more than 20% off. If tone or volume is noticeably poor transformer tap adjustment or a new transformer may be required.
- (3) Requires addition of screen voltage, resistor and bypass condenser. Select resistor to give screen volts approximately equal to actual plate volts.
- (4) This type can be used as a triode by tying screen and suppressor to the plate. As a rectifier tie all grids to plate.
- (5) If separate cathode connections to the diodes are required one or two type 1N34 crystals may be used.
- (6) Screen voltage should be decreased to prevent oscillation with this higher gm tube or to keep within tube ratings.
- (7) Screen voltage may be increased for this type.
- (8) Circuit for this substitution is given on last few pages of this booklet.
- (9) Unused elements should be connected to chassis or cathode terminal.
- (10) Pilot lamp may be omitted or provided for by other means.
- (11) Connect triode elements together to form two diodes having separate cathodes.
- (12) Usable only when space is available for two tubes of this type connected in parallel.
- (13) Usable only in fly-back type power supplies and when peak inverse voltage does not exceed tube rating.
- (14) In many of the older sets a high efficiency transformer and/or yoke may also be required.
- (15) The substitution of these types in RF or mixer oscillator stage is not recommended. Changes in lead length or capacity may make it impossible to align.
- (16) Not usable in circuits requiring separate cathode leads.
- (17) If circuit requires voltage between cathode and heater do not use this type.
- (18) Connect grid and screen to plate to obtain diode characteristics.
- (19) Not recommended for damper service as peak inverse rating is too low.
- (20) These types do not have as high a heater-cathode peak voltage rating as the original tube but may be used in most cases. An isolation transformer insulated for 2500 volts may be used.
- (21) Check load current to be sure it is within ratings of substitute tube.
- (22) Connect triode sections in parallel.
- (23) If arcing occurs peak voltage rating is being exceeded. A type having a higher peak rating will be required.

These substitutions apply particularly for television sets but may be used anywhere providing all changes particularly B and C are considered.

# SUBSTITUTION CHART FOR TELEVISION PICTURE TUBES

**T**HE following tables show some of the possible substitutions which may be made when the required type is temporarily unobtainable. Individual listings of all tube types bearing an A or B suffix have not been included in this table. These letters generally indicate a difference only in face, plate or screen treatment not materially affecting the tube's application. A copy of Sylvania's Television Picture Tube Characteristics Chart lists these types bearing suffixes and indicates their face plate characteristics. The tables have been extended slightly to show a few larger type tubes that may be used when it is desired to increase the size of the picture.

Before undertaking any of the more radical changes, the ease of adjustment provided by the receiver under consideration should be examined. If the focus coil and yoke supporting assembly are not adjustable in the direction of the long axis of the tube, it may be too difficult to use any tube having a longer cone. The wide variety of cabinets will also require that each case be examined carefully to be sure that there is room in the cabinet for the tube. Some designs of deflection and focus coils are longer than others so that short neck tubes cannot be directly interchanged. This fact is indicated in the notes when a short-neck tube would usually be a

good replacement.

The tables indicate the important physical and electrical changes required but it was necessary to make the following assumptions: (a) Since the usual tolerance in the overall length of a picture tube is  $\pm \frac{3}{8}$ " the dimension shown under B is given only to the nearest  $\frac{1}{4}$ ". (b) Since the new wide-angle picture tubes require more scanning power than the older tubes, and since there is usually some adjustment in the receiver circuit, we have assumed that a major coil change will not be required unless the replacement tube's deflection angle is greater than the original tube's by more than 4 degrees. (c) Besides the major changes in bulb dimensions considered under columns A and B there are also small changes in the radius of curvature of the bulb face and the shape of the picture area. This affects the mask dimensions and might give trouble in some sets if the adjustments are not flexible. Small changes in curvature radius of the cone may also be encountered, particularly between glass and metal types.

In a few cases we have listed replacement types smaller than the originals, because there are few or no tubes of the same or larger sizes which would, in our opinion, make practical substitutes.

For details of changes indicated Refer to page 34		BULB DIAMETER	BULB LENGTH	CONNECTOR	ADD ION TRAP MAG.	REMOVE ION TRAP MAG.	CHANGE DEFLECTION COIL TO 15°	CHANGE DEFLECTION COIL TO 18°	ADD FILTER CAPACITANCE	CHANGE TUBE SOCKET	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
3KP4.....	3GP1A.....								H		2
	3JP1.....		-1 1/4						H		
3NP4.....	None.....										
5BP4.....	5NP4.....	No changes									
	7EP4.....	A -1 1/4									
5HP4.....	5NP4.....	No changes									
5TP4.....	None.....										
7DP4.....	10DP4.....	A +3 1/2								K	
7EP4.....	5BP4-A.....	A +1 1/4									
	7JP4.....	-1							H		
7GP4.....	7JP4.....	No changes									
	10HP4.....	A +4 1/4									
	8BP4.....	A +2									
7JP4.....	7GP4.....								F		
	10HP4.....	A +4 1/4									
	8BP4.....	A +2									
8AP4.....	10MP4.....	A +2 3/4	C D2								4, 1
	12VP4.....	A +3 3/4	C D2								4, 1
	10BP4.....	A +3 1/2	C D2								8, 4
	10FP4.....	A +3 1/2	C		E						1, 8, 4
	12JP4.....	A +3	C		E						8, 1
	12UP4.....	A +4 1/2	D2								8, 1
9AP4.....	12AP4.....	A +4 3/8									
10BP4.....	10CP4.....	-1	C		E						
	10FP4.....				E						
	12JP4.....	A	C		E					K	
	12KP4.....	A			E						

For details of changes indicated Refer to page 34		BULB DIAMETER	BULB LENGTH	CONNECTOR	ADD ION TRAP MAG.	REMOVE ION TRAP MAG.	CHANGE DEFLECTION COIL TO 15°	CHANGE DEFLECTION COIL TO 18°	ADD FILTER CAPACITANCE	CHANGE TUBE SOCKET	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
10BP4.....	12LP4.....	A +1									
(Continued)	12UP4.....	A +1	C							K	6
	14BP4 □.....	A						G			
	14CP4 □.....	A -1	D1					G			
10CP4.....	10BP4.....	+1	C D2								
	10FP4.....	+1	C								
	12JP4.....	A +1 1/2									
	12KP4.....	A +1	C								
	12LP4.....	A +1 1/4	C D2								
	12UP4.....	A +2	C D2							K	6
	14BP4 □.....	A	C D2					G			
	14CP4 □.....	A	C		E			G			
10DP4.....	7DP4.....	A -3 1/2			F						4
10FP4.....	10BP4.....		D2								
	10CP4.....	-1	C								
	12JP4.....	A	C							K	
	12KP4.....	A									
	12LP4.....	A +1	D2								
	12UP4.....	A +1	C D2							K	6
	14BP4 □.....	A -1	D2					G			
	14CP4 □.....	A -1	D1					G			
10HP4.....	7GP4.....	A -4 3/4			F						
	7JP4.....	A -4 3/4			F						
	10GP4.....	-1 1/2									
	8BP4.....	A -2 3/4									
10MP4.....	8AP4.....	A -2 3/4	C D1		F						6
	12VP4.....	A +1	D1								1, 6
	Also 10" types under 10BP4 but add note										8
12AP4.....	9AP4.....	A -4 1/4									
12JP4.....	12KP4.....	A	C								4

□ Indicates rectangular tubes

**SAFETY FIRST:** Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.

# PENNSYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 34		BULB DIAMETER	BULB LENGTH	CONNECTOR	ADD 100 TRAP MAG.	REMOVE ON TRAP MAG.	CHANGE OPERATING	CHANGE RFLX. COEFF.	CHANGE TUNE SOCKET	ADD INTX CAPACITANCE	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
12JP4 (Cont'd)	12LP4	A	+1 ¼	C	D2						4
	12QP4	A			D1						
	12RP4				D1					K	
	12TP4	A	+1 ¼	C	D2						
	12UP4	A	+1 ¼	C	D2						6
	14BP4 □	A	-¾	C	D2			G			4
	14CP4 □	A	-¾	C	D1			G			
12KP4	12JP4	A		C						K	
	12LP4		+¾		D2						
	12QP4			C	D1					K	
	12RP4	A		C	D1					K	
	12TP4		+¾		D2					K	
	12UP4	A	+1	C	D2					K	6
	14BP4 □	A	-1		D2			G			
	14CP4 □	A	-1		D1			G			
	16LP4	A	+4 ½		D2						
	16TP4 □	A	+½		D1			G			7
12LP4	12JP4	A	-1 ¼	C		E				K	
	12QP4		-1 ¼	C	D1					K	
	12RP4	A	-1 ¼	C	D1					K	
	12TP4									K	
	12UP4	A		C						K	6
	14BP4 □	A	-2					G			
	14CP4 □	A	-2		D1			G			
	16LP4	A	+3 ½								
	16TP4 □	A	-½		D1			G			7
	12KP4		-¾			E					
12QP4	12JP4	A				E					
	12LP4		+1 ¼	C	D2						4
	12RP4	A									
	12TP4		+1 ¼	C	D2						
	12UP4	A	+1	C	D2						6
	14BP4 □	A	-¾	C	D2			G			4
	14CP4 □	A	-¾	C				G			4
	16LP4	A	+4 ¾	C	D2					K	
	16TP4 □	A	+½	C				G			4, 7
	12KP4			C		E					
12TP4	12JP4	A	-¾	C		E					4
	12LP4									K	
	12QP4		-¾	C	D1						
	12RP4	A	-¾	C	D1						
	12UP4	A		C							6
	14BP4 □	A	-2					G			4
	14CP4 □	A	-2		D1			G			4
	16LP4	A	+3 ½								4
	16TP4 □	A	-¾		D1			G			7
	12KP4		-1			E					4
12UP4	12JP4	A	-1	C		E					
	12KP4		-1	C		E					4
	12LP4			C							4
	12QP4		-1	C	D1						
	12RP4	A	-1	C	D1						
	12TP4			C							
	14BP4 □	A	-2 ¼					G			4
	14CP4 □	A	-2	C	D1			G			4
	16LP4	A	+3 ¾	C							4
	16TP4 □	A	-½	C	D1			G		4, 7	
	16GP4	A	-1		D1			G			7
12VP4	10MP4	A	-1				F				
	8AP4	A			C	D1		F		K	6
	12LP4		+¾								8
	Other 12" types under 12LP4 but add note										8
14BP4 □	14CP4 □				D1						
	14DP4 □									K	
	14EP4 □		-½		D1						7
	16KP4 □	A	+2		D1						
	16TP4 □	A	+1 ½		D1						
	16UP4 □	A	+1 ½		D1					K	

For details of changes indicated  
Refer to page 34

		BULB DIAMETER	BULB LENGTH	CONNECTOR	ADD ON TAP MAG.	REMOVE TAP MAG.	CHANGE TO 5.5 MAG.	CHANGE TO 6.5 MAG.	CHANGE REFLECTION	ADD RUBB CONTACT	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	

14BP4.....17AP4 ☐..... A +2 ... D1..... 7  
(Cont'd) 17BP4 ☐..... A +2 1/4 ... D1.....

If cabinet space permits, round types listed under type 16SP4 may also be used. Add 1" to dimension change B.

14CP4 ☐... 14BP4 ☐..... D2.....  
14DP4 ☐..... D2..... K.....  
14EP4 ☐..... - 1/2 ... D1..... 7  
16KP4 ☐..... A +2 .....  
16TP4 ☐..... A +1 1/2 ..... 7  
16UP4 ☐..... A +1 1/2 ..... K 7  
17AP4 ☐..... A +2 ..... 7  
17BP4 ☐..... A +2 3/4 .....

If cabinet space permits, round types listed under type 16YP4 may also be used. Add 1/4" to dimension change B.

14DP4 ☐... 14BP4 ☐..... 4  
14CP4 ☐..... D1..... 4  
14EP4 ☐..... - 1/2 ... D1..... 4, 7  
16KP4 ☐..... A +2 ..... K 4  
16TP4 ☐..... A +1 1/2 ..... D1..... K 4, 7  
16UP4 ☐..... A +1 1/2 ..... D1..... 4, 7  
17AP4 ☐..... A +2 ..... D1..... K 4, 7  
17BP4 ☐..... A +2 3/4 ..... D1..... K 4

If cabinet space permits, round types listed under type 16WP4 may also be used. Add 1" to dimension change B.

14EP4 ☐... 14BP4 ☐..... + 1/2 ... D2.....  
14CP4 ☐..... + 1/2 .....  
14DP4 ☐..... + 1/2 ... D2..... K.....  
16KP4 ☐..... A +2 1/2 .....  
16TP4 ☐..... A +2 .....  
16UP4 ☐..... A +2 ..... K.....  
17AP4 ☐..... A +2 1/2 ..... 7  
17BP4 ☐..... A +3 1/4 .....

If cabinet space permits, round types listed under type 16YP4 may also be used. Add 1" to dimension change B.

15AP4.....15CP4..... +1 C D2.....  
15DP4..... D2.....  
16AP4..... A +1 3/4 C D2..... 6  
16CP4..... A +1 C D2.....  
16DP4..... A + 1/4 C D2.....  
16EP4..... A -1 C D2..... 6  
16FP4..... A - 1/2 ... D1.....  
16GP4..... A -3 C D1..... G..... 6, 7  
16HP4..... A + 3/4 C D2..... 4  
16JP4..... A + 3/4 C D2..... G..... 4  
16KP4 ☐... A -1 3/4 C D1..... G..... 4  
16LP4..... A +1 3/4 C D2..... 4  
16QP4 ☐... A -1 1/2 C D2..... G.....  
16RP4 ☐... A -1 3/4 C D1..... G..... 4  
16SP4..... A -3 1/4 C D2..... G..... 4, 7  
16TP4 ☐... A -2 1/4 C D1..... G..... 4, 7  
16UP4 ☐... A -2 1/4 C D1..... G..... 7  
16VP4..... A -3 1/4 C D1..... G..... 7  
16WP4..... A -2 3/4 C D2..... G.....  
16WP4A..... A -2 3/4 C D2..... G..... 4  
16XP4 ☐... A -1 3/4 C D2..... G.....  
16YP4..... A -3 1/4 C D1..... G..... 4, 7  
16ZP4..... A +1 3/4 C D2..... 4  
17AP4 ☐... A -2 C D1..... G..... 4, 7  
17BP4 ☐... A -1 1/4 C D1..... G..... 4  
20BP4..... A +8 1/4 C.....

15CP4.....15AP4..... -1 C E.....  
15DP4..... -1 C G.....  
16AP4..... A + 3/4 C..... 6  
16CP4..... A.....  
16DP4..... A - 3/4 G.....  
16EP4..... A -2 C G..... 6

□ Indicates rectangular tubes

**SAFETY FIRST:** Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.



For details of changes indicated  
Refer to page 34

REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		A	B	C	D	E	F	G	H	K	
15CP4.....	16FP4.....	A	-1 1/4	C	D1.....	G					
(Cont'd)	16HP4.....	A	-1 1/4			G				4	
	16JP4.....	A	-1 1/4			G				4	
	16LP4.....	A	+1 1/4							4	
	16ZP4.....	A	+1 1/4							4	
	20BP4.....	A	+7 1/4	C	E						
15DP4.....	15AP4.....				E						
	15CP4.....		+1	C							
	16AP4.....	A	+1 1/4	C						6	
	16CP4.....	A	+1	C							
	16DP4.....	A	+1 1/4	C							
	16EP4.....	A	-1	C						6	
	16FP4.....	A	-1 1/4	C	D1.....						
	16HP4.....	A	+1 1/4	C						4	
	16JP4.....	A	+1 1/4	C						4	
	16LP4.....	A	+1 1/4	C						4	
	16ZP4.....	A	+1 1/4	C						4	
	20BP4.....	A	+8 1/4	C	E						
	17AP4.....	A	-2	C	D1.....	G				4, 7	
	17BP4.....	A	-1 1/4	C	D1.....	G				4	
16AP4.....	16CP4.....		-1 1/4	C							
	16LP4.....			C						4	
	16ZP4.....			C						4	
	20BP4.....	A	+6 1/4	C	E						
	16GP4.....		+3 1/4	C	D1.....	G				7	
	16TP4.....	A	-4 1/4	C	D1.....	G				4, 7	
	17AP4.....	A	-4 1/4	C	D1.....	G				4, 7	
	17BP4.....	A	-3	C	D1.....	G				4	
	19AP4.....	A	-1 1/4	C	D1.....	G					
	19DP4.....	A	-1 1/4	C		G				4	
	19EP4.....	A	-1	C	D1.....	G				4	
16CP4.....	15AP4.....	A	-1	C	E						
	16AP4.....		+1 1/4	C							
	16LP4.....		+1 1/4							4	
	16ZP4.....		+1 1/4							4	
	16GP4.....		-4 1/4	C	D1.....	G				6, 7	
	16TP4.....	A	-3 1/4	C	D1.....	G				4, 7	
	17AP4.....	A	-3	C	D1.....	G				4, 7	
	17BP4.....	A	-2 1/4	C	D1.....	G				4	
	19AP4.....	A		C	D1.....	G				6	
	19DP4.....	A		C		G				4	
	19EP4.....	A	-1 1/4	C	D1.....	G				4	
	20BP4.....	A	+7 1/4	C	E	G					
16DP4.....	16AP4.....		+1 1/4	C						6	
	16CP4.....		+1 1/4								
	16EP4.....		-1	C						6	
	16FP4.....		-1 1/4	C	D1.....						
	16HP4.....		+1 1/4							4	
	16JP4.....		+1 1/4							4	
	16KP4.....	A	-2	C	D1.....					4	
	16LP4.....		+1 1/4							4	
	16QP4.....	A	-1 1/4								
	16RP4.....	A	-2	C	D1.....					4, 7	
	16TP4.....	A	-2 1/4	C	D1.....					4	
	16UP4.....	A	-2 1/4	C	D1.....					7	
	16XP4.....	A	-2								
	16ZP4.....		+1 1/4							4	
	17AP4.....	A	-2	C	D1.....					4, 7	
	17BP4.....	A	-1 1/4	C	D1.....					4	
	19EP4.....	A	+1 1/4	C	D1.....					4	
	20BP4.....	A	+8	C	E						
16EP4.....	16AP4.....		+2 1/4								
	16CP4.....		+2	C							
	16DP4.....		+1 1/4	C							
	16FP4.....		+1 1/4	C	D1.....						
	16HP4.....		+1 1/4	C						4	
	16JP4.....		+1	C						4	
	16KP4.....	A	-1	C	D1.....					4	
	16LP4.....		+2 1/4	C						4	

For details of changes indicated  
Refer to page 34

REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		A	B	C	D	E	F	G	H	K	
16EP4.....	16QP4.....	A	-1 1/4	C							
(Cont'd)	16RP4.....	A	-1	C	D1.....					4	
	16TP4.....	A	-1 1/4	C	D1.....					4, 7	
	16UP4.....	A	-1 1/4	C	D1.....					7	
	16XP4.....	A	-1	C							
	16ZP4.....		+2 1/4	C						4	
	17AP4.....	A	-1	C	D1.....					4, 7	
	17BP4.....	A	-1 1/4	C	D1.....					4	
	19EP4.....	A	+1 1/4	C	D1.....					4	
	20BP4.....	A	+9	C	E						
16FP4.....	16AP4.....		+2	C	D2.....					6	
	16CP4.....		+1 1/4	C	D2.....						
	16DP4.....		+1 1/4	C	D2.....						
	16EP4.....		-1 1/4	C	D2.....					6	
	16HP4.....		+1 1/4	C	D2.....					4	
	16JP4.....		+1	C	D2.....					4	
	16KP4.....	A	-1	C						4	
	16LP4.....		+2 1/4	C	D2.....					4	
	16QP4.....	A	-1 1/4	C	D2.....						
	16RP4.....	A	-1	C						4	
	16TP4.....	A	-1 1/4	C						4, 7	
	16UP4.....	A	-1 1/4	C						7	
	16XP4.....	A	-1	C	D2.....						
	16ZP4.....		+2 1/4	C	D2.....					4	
	17AP4.....	A	-1	C						4, 7	
	17BP4.....	A	-1 1/4	C						4	
	19EP4.....	A	+1 1/4	C						4	
	20BP4.....	A	+8	C	E						
	19GP4.....	A	+1	C							
16GP4.....	16EP4.....		+2	C	D2.....						
	16SP4.....		-1 1/4	C	D2.....					4, 7	
	16KP4.....	A	+1 1/4	C						4	
	16QP4.....	A	+1 1/4	C	D2.....						
	16RP4.....	A	+1 1/4	C						4	
	16TP4.....	A	+1 1/4	C						4	
	16UP4.....	A	+1 1/4	C							
	16VP4.....		-1 1/4	C							
	16WP4.....		-1 1/4	C	D2.....						
	16WP4A.....		-1 1/4	C	D2.....					4	
	16XP4.....	A	+1 1/4	C	D2.....						
	16YP4.....		-1 1/4	C						4	
	17AP4.....	A	+1	C						4	
	19AP4.....	A	+4								
	19DP4.....	A	+4	C	D2.....					4	
	19EP4.....	A	+3 1/4	C						4	
	19FP4.....	A	+4 1/4	C	D2.....						
	19GP4.....	A	+3 1/4	C							
	22AP4.....	A	+5 1/4								
16HP4.....	16AP4.....		+1	C						K 6	
	16CP4.....		+1 1/4							K	
	16DP4.....		-1 1/4							K	
	16EP4.....		-1 1/4	C						K 6	
	16FP4.....		-1	C	D1.....					K	
	16JP4.....		-1 1/4								
	16KP4.....	A	-1 1/4	C	D1.....						
	16LP4.....		+1								
	16QP4.....	A	-2							K	
	16RP4.....	A	-2 1/4	C	D1.....						
	16TP4.....	A	-3	C	D1.....					7	
	16UP4.....	A	-3	C	D1.....					K 7	
	16XP4.....	A	-2 1/4							K	
	16ZP4.....		+1								
	17AP4.....	A	-2 1/4	C	D1.....					7	
	17BP4.....	A	-2	C	D1.....						
	19EP4.....	A		C	D1.....						
	20BP4.....	A	+11	C	E					K	
16JP4.....	16AP4.....		+1 1/4	C						6	
	16CP4.....		+1 1/4								
	16DP4.....	A								K	
	16EP4.....		+1	C						6	

□ Indicates rectangular tubes.

SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.



# SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated  
Refer to page 34

REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		A	B	C	D	E	F	G	H	K	
16JP4.....	16FP4.....	-1/2		C	D1						
(Cont'd)	16HP4.....	+3/2									
	16KP4 <input type="checkbox"/>	A -2		D1							
	16LP4.....	+1 1/2									
	16MP4.....	+1									
	16QP4 <input type="checkbox"/>	A -1 1/2									
	16RP4 <input type="checkbox"/>	A -2		D1							
	16TP4 <input type="checkbox"/>	A +2 1/2		D1						7	
	16UP4 <input type="checkbox"/>	A +2 1/2		D1						7	
	16XP4 <input type="checkbox"/>	A -2									
	16ZP4.....	+1 1/2									
	17AP4 <input type="checkbox"/>	A -2		D1						7	
	17BP4 <input type="checkbox"/>	A -1 1/2		D1							
	19EP4.....	A +3/4		D1							
	20BP4.....	A +8	C		E						
16KP4 <input type="checkbox"/>	16RP4 <input type="checkbox"/>										
	16QP4 <input type="checkbox"/>	+1/2		D2						K	
	16TP4 <input type="checkbox"/>	-1/2								7	
	16UP4 <input type="checkbox"/>	-1/2								K	7
	16XP4 <input type="checkbox"/>			D2						K	
	17AP4 <input type="checkbox"/>	A								7	
	17BP4 <input type="checkbox"/>	A +1/2									
If cabinet space permits, round types listed under 16YP4 may also be used.											
16LP4.....	15AP4.....	A -3/4	C		E					K	
	15CP4.....	A -3/4								K	
	16AP4.....		C							K	6
	16CP4.....	-3/4								K	
	16ZP4.....										
	16GP4.....	-4 3/4	D1		G					K	6, 7
	16TP4 <input type="checkbox"/>	A -4	D1		G					K	7
	17AP4 <input type="checkbox"/>	A -3 3/4	D1		G					7	
	17BP4 <input type="checkbox"/>	A -3	D1		G						
	19AP4.....	A -3/4	C D1		G					K	6
	19DP4.....	A -3/4			G						
	19EP4.....	A -1	D1		G						
	20BP4.....	A +6 1/2	C		E					K	
16MP4.....	16AP4.....	+1/2	C							K	6
	16CP4.....	-3/4								K	
	16DP4.....	-1								K	
	16EP4.....	-2	C							K	6
	16FP4.....	-1 1/2	C D1							K	
	16HP4.....	-1/2									
	16JP4.....	-1									
	16KP4 <input type="checkbox"/>	A -3	D1		G						
	16LP4.....	+1 1/2									
	16QP4 <input type="checkbox"/>	A -2 1/2			G					K	
	16RP4 <input type="checkbox"/>	A -3	D1		G						
	16TP4 <input type="checkbox"/>	A -3 1/2	D1		G					7	
	16UP4 <input type="checkbox"/>	A -3 1/2	D1		G					K	7
	16XP4 <input type="checkbox"/>	A -3			G					K	
	16ZP4.....	+1/2									
	17AP4 <input type="checkbox"/>	A -3	D1							7	
	17BP4 <input type="checkbox"/>	A -2 1/2	D1								
	19EP4.....	A -3/4	D1								
	20BP4.....	A +7	C		E					K	
16QP4 <input type="checkbox"/>	16KP4 <input type="checkbox"/>	-1/2		D1						4	
	16RP4 <input type="checkbox"/>	-1/2		D1						4	
	16TP4 <input type="checkbox"/>	-1	D1							4, 7	
	16UP4 <input type="checkbox"/>	-1	D1							7	
	16XP4 <input type="checkbox"/>	-1/2									
	17AP4 <input type="checkbox"/>	A -1/2	D1							4, 7	
	17BP4 <input type="checkbox"/>	A	D1							4	
If cabinet space permits, round types listed under 16WP4 may also be used.											
16RP4 <input type="checkbox"/>	16KP4 <input type="checkbox"/>										
	16QP4 <input type="checkbox"/>	+1/2	D2							K	
	16TP4 <input type="checkbox"/>	-3/4								7	
	16UP4 <input type="checkbox"/>	-3/4								K	7

For details of changes indicated  
Refer to page 34

REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		A	B	C	D	E	F	G	H	K	
16RP4.....	16XP4 <input type="checkbox"/>			D2						K	
(Cont'd)	17AP4 <input type="checkbox"/>	A								7	
	17BP4 <input type="checkbox"/>	A +1/2									
If cabinet space permits, round types listed under 16YP4 may also be used.											
16SP4.....	16AP4.....	+5	C							K	6
	16CP4.....	+4 1/4								K	
	16DP4.....	+3 1/2								K	
	16EP4.....	+2 1/2	C							K	6
	16FP4.....	+3	C D1							K	
	16GP4.....	+1/4	C D1							K	6
	16HP4.....	+4									
	16JP4.....	+3 1/2									
	16KP4 <input type="checkbox"/>	A +1 1/2	D1								
	16LP4.....	+5									
	16MP4.....	+4 1/2									
	16QP4 <input type="checkbox"/>	A +1 1/2								K	
	16RP4 <input type="checkbox"/>	A +1 1/2	D1								
	16TP4 <input type="checkbox"/>	A +3/4	D1								
	16UP4 <input type="checkbox"/>	A +3/4	D1							K	
	16VP4.....		D1							K	
	16WP4.....	+1/2								K	
	16WP4A.....	+3/4									
	16XP4 <input type="checkbox"/>	A +1 1/2								K	
	16YP4.....		D1								
	16ZP4.....	+5									
	17AP4 <input type="checkbox"/>	A +1 1/4	D1								
	17BP4 <input type="checkbox"/>	A +2	D1								
	19AP4.....	A +4 3/4	C D1							K	6
	19DP4.....	A +4 3/4									
	19EP4.....	A +3 3/4	D1								
	19FP4.....	A +4 3/4								K	
	19GP4.....	A +4	D1							K	
	20BP4.....	A +11 1/2	C		E					K	
	22AP4.....	A +5 1/2	C D1							K	6
16TP4 <input type="checkbox"/>	16KP4 <input type="checkbox"/>	+1/4									
	16QP4 <input type="checkbox"/>	+1	D2							K	
	16RP4 <input type="checkbox"/>	+1/4									
	16UP4 <input type="checkbox"/>									K	
	16XP4 <input type="checkbox"/>	+1/4	D2							K	
	17AP4 <input type="checkbox"/>	A +1/2									
	17BP4 <input type="checkbox"/>	A +1 1/4									
If cabinet space permits, round types listed under 16YP4 may also be used.											
16UP4 <input type="checkbox"/>	Same as listed above for type 16TP4 with deletion of note K when present and addition of note 4 for types not having note K.										
16VP4.....	16AP4.....	+5	C D2							6	
	16CP4.....	+4 1/4	D2								
	16DP4.....	+3 1/2	D2								
	16EP4.....	+2 1/2	C D2							6	
	16FP4.....	+3	C								
	16GP4.....	+1/4	C							6	
	16HP4.....	+4	D2							4	
	16JP4.....	+3 1/2	D2							4	
	16KP4 <input type="checkbox"/>	A +1 1/2								4	
	16LP4.....	+5	D2							4	
	16MP4.....	+4 1/2	D2							4	
	16QP4 <input type="checkbox"/>	A +1 1/2	D2								
	16RP4 <input type="checkbox"/>	A +1 1/2								4	
	16SP4 <input type="checkbox"/>		D2							4	
	16TP4 <input type="checkbox"/>	A +3/4								4	
	16UP4 <input type="checkbox"/>	A +3/4									
	16WP4.....	+1/2	D2								
	16WP4A.....	+3/4	D2							4	
	16XP4 <input type="checkbox"/>	A +1 1/2	D2								
	16YP4.....									4	
	16ZP4.....	+5	D2							4	
	17AP4 <input type="checkbox"/>	A +1 1/4								4	

☐ Indicates rectangular tubes.

SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.

For details of changes indicated  
Refer to page 34

REQUIRED TYPE	POSSIBLE REPLACEMENTS										
		BULB DIAMETER	BULB LENGTH	CONNECTOR	REMOVE ION TRAP MAG.	CHANGE ORATING	CHANGE REFLECTION	ADD FILTER CAPACITANCE	CHANGE TUBE SOCKET	NOTE NO.	
16VP4....	17BP4 □....	A	+2								4
(Cont'd)	19AP4....	A	+4 1/4	C							6
	19DP4....	A	+4 1/4	D2							4
	19EP4....	A	+3 1/4								4
	19FP4....	A	+4 1/4	D2							
	19GP4....	A	+4								
	20BP4....	A	+11 1/2	C	E						
	22AP4....	A	+5 1/2	C							6
16WP4....	16AP4....	+4 1/2	C								6
	16CP4....	+4									
	16DP4....	+3									
	16EP4....	+1 1/4	C								6
	16FP4....	+2 1/2	C D1								
	16GP4....	-1/4	C D1								7
	16HP4....	+3 1/4									4
	16JP4....	+3									4
	16LP4....	+4 1/2									4
	16MP4....	+4									4
	16QP4 □....	A	+1 1/4								4, 7
	16KP4 □....	A	+1	D1							4
	16RP4 □....	A	+1	D1							4
	16SP4....	-1/2									4, 7
	16TP4 □....	A	+1/4	D1							4, 7
	16UP4 □....	A	+1/4	D1							7
	16VP4....	-1/2	D1								7
	16WP4A....										4
	16XP4 □....	A	+1								
	16YP4....	-1/2	D1								4, 7
	16ZP4....	+5 1/2									4
	17AP4 □....	A	+1/4	D1							4, 7
	17BP4 □....	A	+1 1/2	D1							4
	19AP4....	A	+3 1/4	C D1							6
	19DP4....	A	+3 1/4								4
	19EP4....	A	+3 1/4	D1							4
	19FP4....	A	+4 1/4								
	19GP4....	A	+3 1/2	D1							
	20BP4....	A	+11	C	E						
	22AP4....	A	+5	C D1							6
16WP4A....	Same as listed above for type 16WP4 with addition of note K for types not having note 4.										
16XP4 □....	16KP4 □....		D1								4
	16QP4 □....	+1/2									
	16RP4 □....		D1								4
	16TP4 □....	-1/2	D1								4, 7
	16UP4 □....	-1/2	D1								7
	17AP4 □....	A		D1							4, 7
	17BP4 □....	A	+1/2	D1							4
	If cabinet space permits, round types listed under 16WP4 may also be used.										
16YP4....	Same types as listed for 16VP4 with addition of note K for types not having note 4.										
16ZP4....	16LP4....										
	Also any type listed under 16LP4 with same changes.										
17AP4 □....	16QP4 □....	A	+1/2	D2							K
	16KP4 □....	A									
	16RP4 □....	A									
	16TP4 □....	A	-1/2								
	16UP4 □....	A	-1/2								K
	16XP4 □....	A		D2							K
	17BP4 □....		+1/4								
	If cabinet space permits, round types listed under 16KP4 may also be used.										
17BP4 □....	17AP4 □....	-1/4									7
	16QP4 □....	A		D2							K
	16KP4 □....	A	-1/2								
	16RP4 □....	A	-1/2								
	16TP4 □....	A	-1								7
	16UP4 □....	A	-1								K 7
	16XP4 □....	A	-1/2	D2							K

For details of changes indicated  
Refer to page 34

REQUIRED TYPE	POSSIBLE REPLACEMENTS										
		BULB DIAMETER	BULB LENGTH	CONNECTOR	REMOVE ION TRAP MAG.	CHANGE ORATING	CHANGE REFLECTION	ADD FILTER CAPACITANCE	CHANGE TUBE SOCKET	NOTE NO.	
17BP4....	If cabinet space permits, round types listed under (Cont'd) 16YP4 may also be used.										
19AP4....	17AP4 □....	A	-3	C							4, 6, 7
	17BP4 □....	A	-2 1/4	C							4, 6
	19DP4....	A		C D2							4, 6
	19EP4....	A	-1 1/2	C							4, 6
	19FP4....		+1 1/2	C D2							6
	19GP4....		-1/4	C							6
	20BP4....	A	+7 1/4	C	E						6
	22AP4....	A	+1 1/2								
	Also other types listed under 16GP4 with addition of change A and 4" decrease in length differential.										
19DP4....	17AP4 □....	A	-3	D1							7
	17BP4 □....	A	-2 1/4	D1							
	19AP4....			C D1							K 6
	19EP4....	A	-1 1/2	D1							
	19FP4....		+1 1/2								K
	19GP4....		-1/4	D1							K
	20BP4....	A	+7 1/4	C	E						K
	22AP4....	A	+1 1/2	C D1							K 6
	Also any 16" types listed under 16SP4 with addition of change A and 4 1/4" decrease in length differential										
19EP4....	17AP4 □....	A	-2 1/2								7
	17BP4 □....	A	-2								
	20BP4....	A	+7 1/2	C	E						K
	22AP4....	A	+1 1/4	C							K 6
	Also 16" types listed under 16YP4 with 3 1/4" decrease in length differential.										
19FP4....	17AP4 □....	A	-3 1/2	D1							7, 4
	17BP4 □....	A	-2 1/4	D1							4, 6
	19AP4....		-1 1/2	C D1							6
	19DP4....		-1/2								4
	19EP4....	A	-1	D1							4
	19GP4....	A	-1/4	D1							
	20BP4....	A	+6 1/4	C	E						
	22AP4....	A	+1	C D1							6
	Also 16" types listed under 16WP4 with 4 1/4" decrease in length differential.										
19GP4....	17AP4 □....	A	-2 1/4								7, 4
	17BP4 □....	A	-2								4
	19AP4....		+1 1/4	C							6
	19DP4....		+1 1/4	D2							4
	19EP4....	A	-1/4								4
	19FP4....		+1 1/4	D2							
	20BP4....	A	+7 1/4	C	E						
	22AP4....	A	+1 1/2	C							6
	Also 16" types listed under 16VP4 with 4" decrease in length differential.										
20BP4....	16AP4....	A	-6 1/2	C D2							
	16CP4....	A	-7 1/4	C D2							
	16LP4....	A	-6 1/2	C D2							4
	16ZP4....	A	-6 1/2	C D2							4
	16KP4 □....	A	-10	C D1							4
	16QP4 □....	A	-9 1/2	C D2							
	16RP4 □....	A	-10	C D1							4
	16TP4 □....	A	-10 1/2	C D1							4, 7
	16UP4 □....	A	-10 1/2	C D1							7
	16XP4 □....	A	-10	C D2							
	17AP4 □....	A	-10	C D1							4, 7
	17BP4 □....	A	-9 1/2	C D1							4
	22AP4....	A	-6	C D1							6
22AP4....	19AP4....	A	-1 1/2								
	19DP4....	A	-1 1/2	C D2							4
	19EP4....	A	-1 1/4	C							4
	19FP4....	A	-1	C D2							
	19GP4....	A	-1 1/2	C							
	20BP4....	A	+6	C	E						
	Also 16" types listed under 16GP4 with 5" decrease in length differential.										

□ Indicates rectangular tubes.

SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.

## SYLVANIA SUBSTITUTION MANUAL

### NOTES FOR PICTURE TUBE SUBSTITUTION CHART

- A. Make adjustment for different bulb diameter or shape.
  - B. Number of inches the replacement tube is longer (+) or shorter (-) than the original tube.
  - C. Change anode connector to type required for the substitute tube.
  - D. Add or change permanent magnet type ion trap magnet. D1 indicates single field and D2 double field type required. When no change is indicated by notes D or E the type of ion trap magnet used on the original tube should be used.
  - E. Remove the ion trap magnet. If the ion trap magnet is the permanent magnet type, just remove it with the tube; if it is the coil type magnet leave it in the circuit and put it somewhere in the cabinet, out of the way, so that no circuit changes will be necessary.
  - F. Suggested only if the operating conditions of the receiver do not exceed the maximum ratings of the substitute tube.
  - G. Requires change of deflection yoke to 70° type and possibly a new horizontal output transformer and/or tube.
  - H. Change in picture tube socket is required.
  - K. Original tube had an external coating which provided a high voltage filter capacitor. Additional external capacitance may be required to replace that normally supplied by the original picture tube.
  - (1) Increase in power supply voltage may be necessary for optimum performance.
  - (2) May be used only when no potential is required between heater and cathode.
  - (4) Replacement type has coating on bulb which provides filter capacitance. Be sure this coating is grounded. The underwriter's safety code requires that the total high voltage filter capacity be limited to 2000  $\mu\text{f}$  at the usual operating voltage. The original filter capacitance should be disconnected in most cases.
  - (6) Substitution of a metal cone tube for a coated glass tube may also require rearrangement of any parts near the metal cone to prevent corona discharge and removal of any contacts formerly grounding the bulb coating. Additional insulation is usually necessary at the cone lip since a wood cabinet alone is not sufficient to protect the user.
  - (7) Substitution of a short-neck, wide-angle picture tube for a long-neck tube may require a change in focus coil and/or deflection coil.
  - (8) Substitution of tetrode types for this triode type requires the addition of a 250-300 volt source of accelerator voltage. A voltage divider drawing 25  $\mu\text{a}$  is a possible solution.
- ☐ Indicates rectangular tubes.

**SAFETY FIRST:** Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.

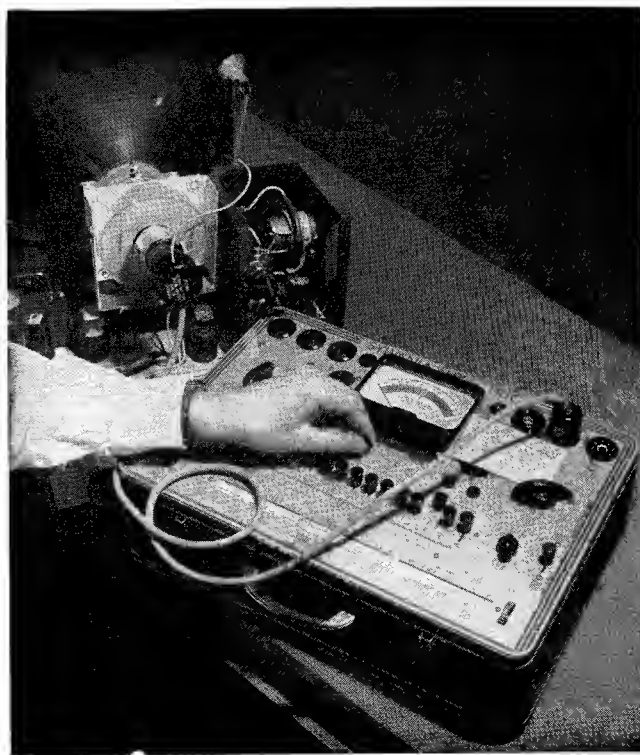
## SYLVANIA CATHODE RAY TUBE TEST ADAPTOR

Standard procedure for testing television picture tubes today consists of the old-fashioned substitution method. That can all be changed if you own a Sylvania Tube Tester Model 139, 140, 219 or 220 and a Sylvania 228 CR Tube Test Adaptor. With this combination, all of the commonly used 10 to 19 inch magnetic types\* can be checked.

By placing your Sylvania tube tester close to the chassis, the picture tube need not be removed from the cradle—a real time saver in many sets. After making sure the set is turned off, the adaptor is plugged in according to the instructions with the unit and settings determined from the accompanying card. Since only a few hundred volts are available, as compared to 10,000 or more in the receiver, comparative readings are taken from the small numerical scale rather than on the "GOOD-BAD" scale.

There are a few picture tube defects, such as gas, that show up only with high voltage, but this tester will determine 85% of cases where the picture tube should be replaced. Shorts, leakage, open circuits, and relative emission are easily determined. Most other defects, such as a damaged screen coating, can be determined by observing the picture.

The socket provided is the almost universal duodecal. Test settings are provided for such popular tubes as 10BP4, 10FP4, 12KP4, 12LP4, 14BP4, 14CP4, 16AP4, 16GP4, 16JP4, 16LP4, 16RP4, 16TP4, 16WP4, 16ZP4, 17AP4, 17BP4, 17CP4, 19AP4, 20CP4, 20DP4 and any A or B versions of these.

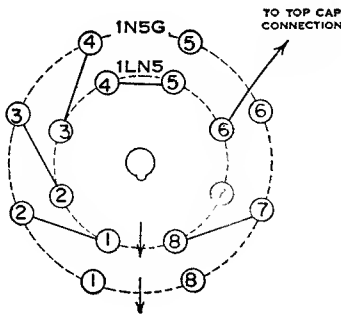


\*Will not test electrostatic deflection type tubes or tubes with no accelerating electrode, such as the 10MP4 and 12VP4.

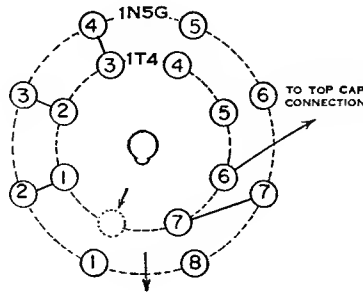
# ADAPTOR CIRCUITS COMMONLY REQUIRED

## AMPLIFIERS

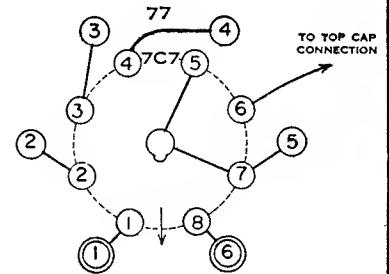
TYPE 1LN5 REPLACING TYPE 1N5G



TYPE 1T4 REPLACING TYPE 1N5G

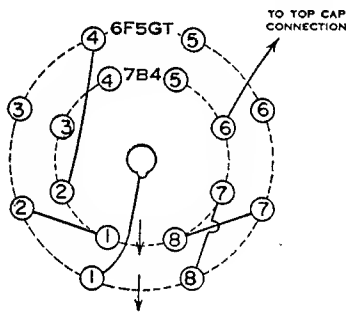


TYPE 7C7\* REPLACING TYPE 77  
TYPE 7A7 REPLACING TYPE 78  
7B7\* REPLACING TYPE 6D6

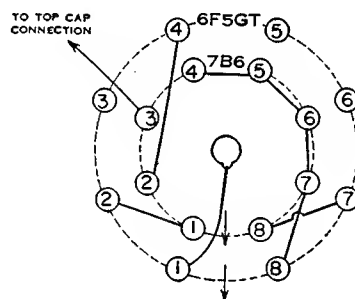


\* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 7B4 REPLACING TYPE 6F5GT

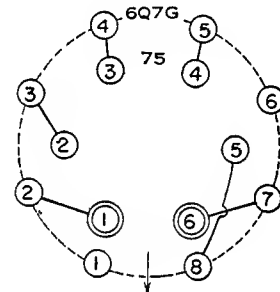


TYPE 7B6 REPLACING TYPE 6F5GT  
7C6\*

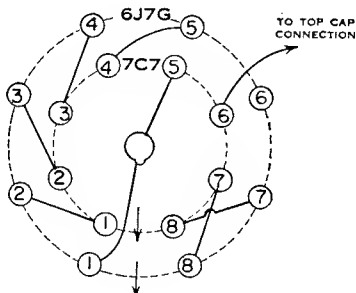


\* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 75 REPLACING TYPE 6Q7G  
TYPE 43 REPLACING TYPE 25L6  
TYPE 41 REPLACING TYPE 6F6  
42 REPLACING TYPE 6K6  
6U6  
6V6

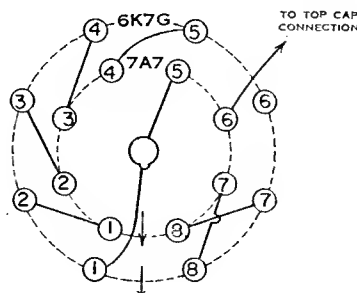


TYPE 7C7\* REPLACING TYPE 6J7GT  
7L7  
TYPE 14C7 REPLACING TYPE 12J7GT  
7C7

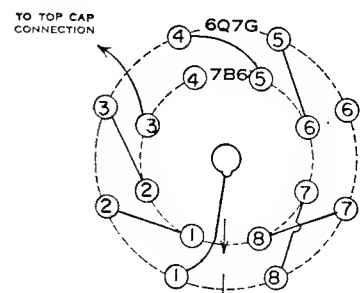


\* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 7H7 REPLACING TYPE 6K7GT  
7A7  
TYPE 14H7 REPLACING TYPE 12K7GT  
14A7



TYPE 7B6 REPLACING TYPE 6Q7GT  
7C6\*  
TYPE 7C6 REPLACING TYPE 12Q7GT  
14B6



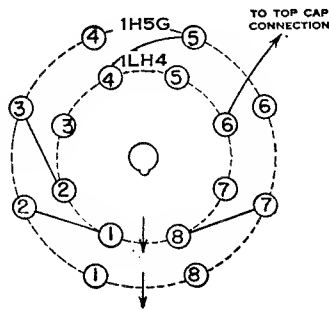
\* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

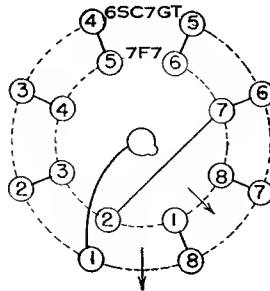
# ADAPTOR CIRCUITS COMMONLY REQUIRED

## AMPLIFIERS CONT'D

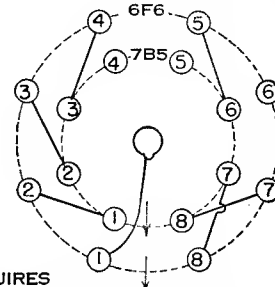
TYPE 1LH4 REPLACING TYPE 1H5GT



TYPE 7F7 REPLACING TYPE 6SC7GT

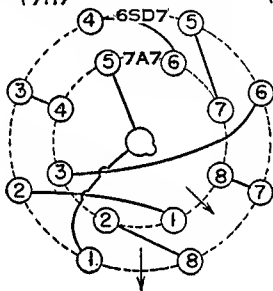


TYPE 1LA4 REPLACING TYPE 1A5G  
 TYPE 35A5 REPLACING TYPE 35L6  
 TYPE 50A5 REPLACING TYPE 50L6GT  
 TYPE 14C5\* REPLACING TYPE { 25L6G  
 TYPE { 7A4 REPLACING TYPE 6C5GT  
 TYPE 7B5 REPLACING TYPE { 6F6  
 6K6  
 6U6  
 6V6



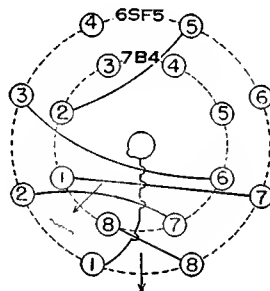
\* REQUIRES  
 175 OHMS ACROSS HEATERS IN AC-DC  
 SETS AND 42 OHMS IN SERIES STRING.

TYPE { 7C7 REPLACING TYPE { 12SJ7GT  
 14C7 6SJ7GT \*  
 TYPE { 14H7 REPLACING TYPE 12SK7GT  
 14A7  
 TYPE { 7A7 REPLACING TYPE { 6SD7GT  
 7H7 6SK7GT

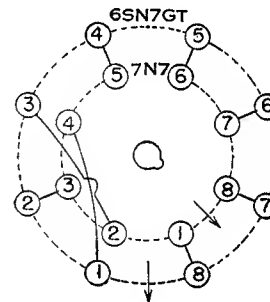


\* REQUIRES 42 TO 50 OHMS ACROSS  
 HEATERS IN AC-DC SETS.

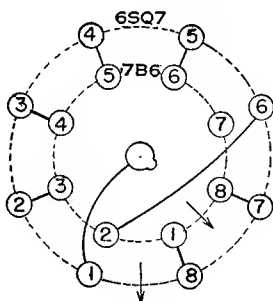
TYPE 7B4 REPLACING TYPE 6SF5



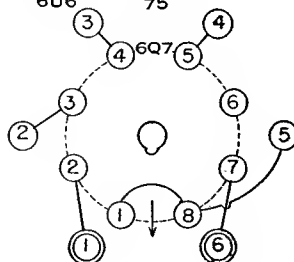
TYPE 7N7 REPLACING TYPE 6SN7GT



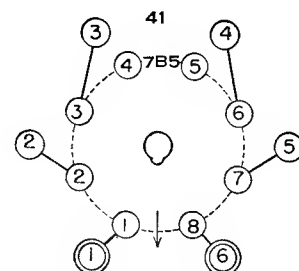
TYPE 7B6 REPLACING TYPE 6SQ7  
 TYPE 14B6 REPLACING TYPE 12SQ7



TYPE 6Q7GT REPLACING TYPE 75  
 TYPE 25L6 REPLACING TYPE 43  
 TYPE { 6K6 REPLACING TYPE { 41  
 6V6 75 42  
 6F6  
 6U6



TYPE 7B5 REPLACING TYPE { 41  
 42



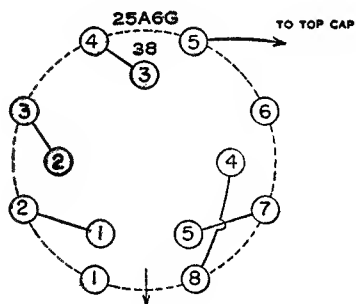
INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE  
 SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE  
 WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

SYLVANIA

# ADAPTOR CIRCUITS COMMONLY REQUIRED

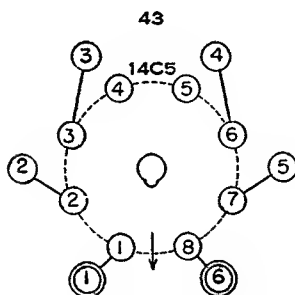
## AMPLIFIERS CONT'D

TYPE 38 REPLACING TYPE 25A6G



ADD 70 OHMS IN SERIES WITH HEATER IN AC-DC SETS.

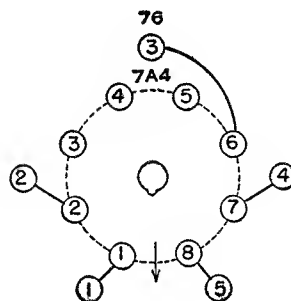
TYPE 14C5 REPLACING TYPE 43



REQUIRES

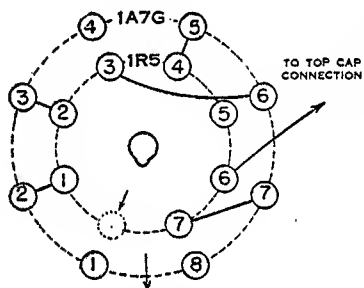
175 OHMS ACROSS HEATERS IN AC-DC SETS AND 42 OHMS IN SERIES STRING.

TYPE 7A4 REPLACING TYPE 76



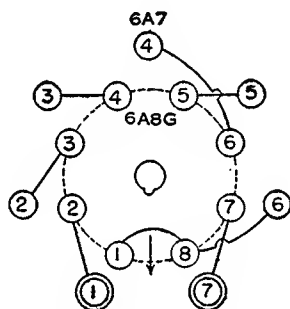
## CONVERTERS

TYPE 1R5 REPLACING TYPE 1A7G

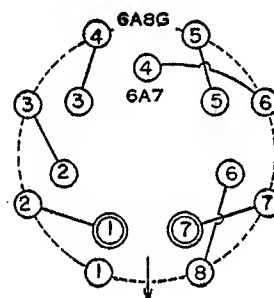


IN SOME LOCATIONS SENSITIVITY MAY BE TOO LOW FOR AVAILABLE SIGNAL STRENGTH.

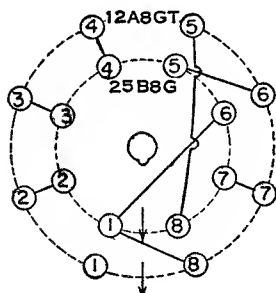
TYPE 6K8G REPLACING TYPE 6A7  
6J8G REPLACING TYPE 6A8G



TYPE 6A7 REPLACING TYPE 6A8G

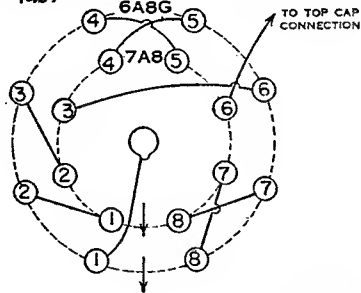


TYPE 25B8GT REPLACING TYPE 12A8GT  
TYPE 12B8GT REPLACING TYPE 6A8G



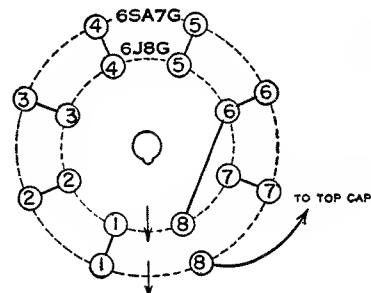
TYPE 7B8 REPLACING TYPE 6A8G  
7A8\* REPLACING TYPE 6J8G  
7J7 REPLACING TYPE 6K8G

TYPE 7A8 REPLACING TYPE 12A8GT  
14B8 REPLACING TYPE 12K8G  
14J7 REPLACING TYPE 12K8G



\* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 6J8G REPLACING TYPE 6SA7GT  
TYPE 12K8G REPLACING TYPE 12SA7GT

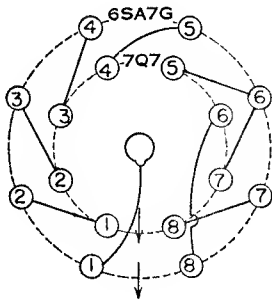


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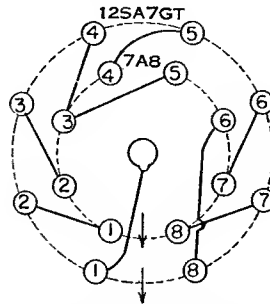
# ADAPTOR CIRCUITS COMMONLY REQUIRED

## CONVERTERS CONTD

TYPE 7Q7 REPLACING TYPE 6SA7GT  
TYPE 14Q7 REPLACING TYPE 12SA7

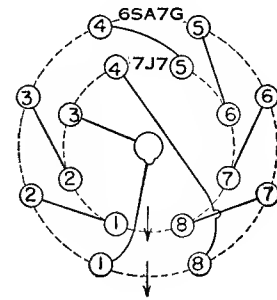


TYPE { 7A8  
14B8 } REPLACING TYPE 12SA7GT  
TYPE { 7B8  
7A8 \* } REPLACING TYPE 6SA7GT



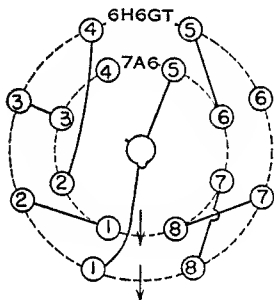
\* REQUIRES 42 TO 50 OHMS ACROSS  
HEATERS IN AC-DC SETS.

TYPE { 14S7  
14J7 } REPLACING TYPE 12SA7GT  
TYPE { 7S7  
7J7 } REPLACING TYPE 6SA7GT



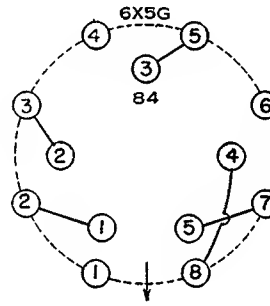
## RECTIFIERS

TYPE 7A6 REPLACING TYPE 6H6GT

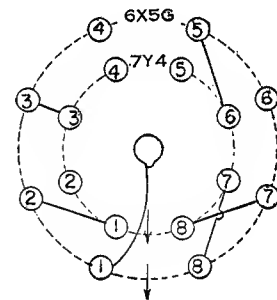


REQUIRES 42 TO 50 OHMS ACROSS  
HEATERS IN AC-DC SETS.

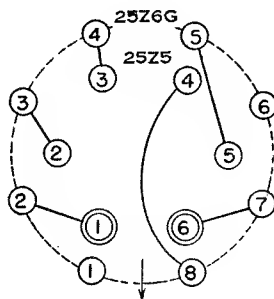
TYPE 84 REPLACING TYPE 6X5G



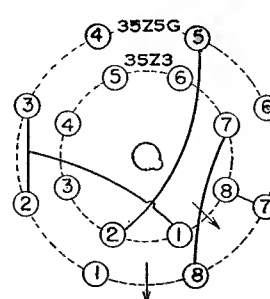
TYPE 7Y4 REPLACING TYPE 6X5G



TYPE 25Z5 REPLACING TYPE 25Z6G

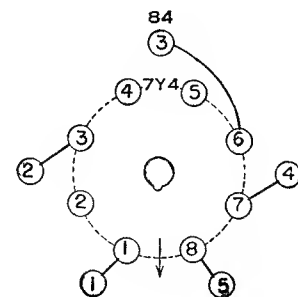


TYPE 35Z3 REPLACING TYPE 35Z5GT/G



OTHER PROVISION NECESSARY FOR  
PILOT LAMP.

TYPE 7Y4 REPLACING TYPE 84

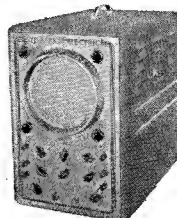


INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE  
SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE  
WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

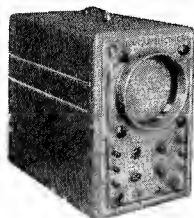
# Look to SYLVANIA for the latest in ELECTRONIC TEST EQUIPMENT



**Television Oscilloscope.** An Exceptionally High-Gain, Wide-Band Oscilloscope Designed for Television. Accurately displays any TV pulse or wave-shape on a large, eye-saving 7" screen. Sensitivity: 0.01 v./in. Vert. response useful to 4.0 mc. Hard-tube sweeps to 50 kc.; phasing control; pos. or neg. sync. control; many other outstanding features. Recommended for servicemen; laboratories; advanced schools and industry.



Type 400



Type 132Z

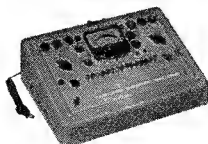
**General Purpose Oscilloscope.** A Versatile 7" Scope with Many Features Found in Type 400 above, priced as low as oscilloscopes with smaller screens. Sensitivity: 0.10 v./in.; freq. response: exceeds 7 cps. to 70 kc. Widely used by servicemen, schools and industry for AM-FM-TV testing.

**TV High-Voltage Probes.** New, Quality Probes that Permit Measuring High TV Anode Voltages by increasing the dc range of Polymeters to 30,000 or 10,000 volts. Special conversion cartridge permits using 30 kv probes with ANY 1,000 volt scale 20,000 ohm/volt meter. Select correct probe from list below:



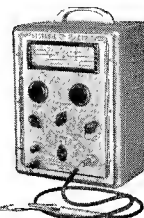
Type	Range	Use with
225	30 kv	Polymer, Type 221 or 221Z.
224	30 kv	Earlier Polymeters, Types 134 and 134Z.
226	30 kv	Conversion cartridge for use with above Type 225 or 224 to convert ANY 20,000 ohm/volt meter with a 1000-volt scale to a kilovoltmeter
223	10 kv	Polymer, Type 221 or 221Z.
222	10 kv	Earlier Polymeters, Types 134 and 134Z.

**Tube Tester Type 220.** Made By A Tube Manufacturer For Tube Users, these instruments test for ALL usual faults—not just one particular characteristic. New and exclusive ohmmeter-type shorts/leakage test indicates "GOOD" or "REPLACE" directly on the illuminated meter. Gas and a special heater-cathode leakage tests made in single operations. Single composite dynamic test for emission, transconductance and relative tube life. Panel-mounted roller-chart; convenient switches; provisions for future tubes. Portable Type 220 has durable metal case and handle; removable cover. Size: 6" x 11 1/4" x 17".



**Tube Tester Type 219.** The counter Type 219 is electrically equivalent to the portable type. Attractively housed in a streamlined wood and metal cabinet. Adaptable to any surroundings. Occupies small counter space. Size: 5 7/8" x 13" x 18 7/8".

Type 500



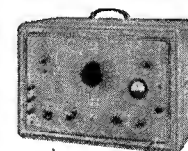
**TV Signal Generator.** An ALL ELECTRONIC Sweep Generator for TV and FM. Fundamental center frequencies: 2-25, 20-64, 60-120, and 140-230 mc. Two adjustable sweep widths: 0-600 kc./15 mc.; excellent sweep linearity; output 0.1 v. Edge-lighted dial; simplified controls; small size: 11 1/2" x 8 1/2" x 7". May be used with any 'scope and marker including those shown at left and below.

**Polymer—TV Vacuum-Tube Voltmeter.** A Sensitive DC, AC and RF Vacuum-Tube Voltmeter, Ohmmeter and DC Current Meter. The basic instrument for every TV, FM and AM shop. Ranges: rf to 300 volts (only 3  $\mu$ f shunt capacity); ac and dc to 1000 volts (10 or 30 kv dc using h.v. probes described at left); dc current from 50 microamperes to 10 amperes; and resistance from 0.5 to one billion ohms. Frequency range to 300 megacycles. High input impedance on all voltage ranges. Size identical to TV generator above.



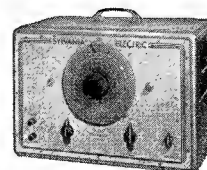
Type 221Z

**FM-AM Signal Generator.** Useful as a TV Marker. A versatile AM-FM generator, doubly useful for peaking alignment of TV and as a TV marker. Calibrated to 0.05%. Fundamentals 80 kc to 120 mc; harmonics to 240 mc. Modulation: 0-100% AM; 0-30/150/700 kc FM. 1.0 volt max. output. Low leakage. Built-in crystal circuit. Size same as audio oscillator below.



Type 216

**Audio Oscillator.** An Accurate Sine-Wave Generator for Better Equipped Shops and Sound Specialists. Maximum output: 22.5 volts, 20-20,000 cps, flat within 2 db. size 11 3/8" x 17 1/16" x 9 3/16"



Type 145

# SYLVANIA ELECTRIC



